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HÆMATEMESIS FROM GASTRIC ULCER; NOTES ON OVER TWO HUNDRED CASES.[1]

By W. Gilman Thompson, M.D.,
of New York.

The present inquiry was undertaken with the view of formulating the indications for operation in cases of gastric ulcer. The cases have been collected from the records of the Presbyterian and Bellevue Hospitals, and from private sources, numbering collectively more than 200.

During the past sixteen years there have been treated at the Presbyterian Hospital 195 cases in which the diagnosis of gastric ulcer has been made, including 167 females and 28 males—a proportion of 6 to 1.

The most interesting feature of these cases is the fact that so large a number, considerably more than one-half, were discharged as "cured" after serious hæmatemesis which occurred either immediately before admission or during the patient's stay in the hospital, or both. The exact figures are as follows:

Hæmatemesis: "Cured" under medical treatment	111
Improved " "	19
Unimproved " "	3
Died " "	41
Melæna without hæmatemesis	1
Ulcer without hæmatemesis (cured)	20
	195

The total deaths, numbering 41, present a ratio of 1 death to 4.8 cases. Included in the deaths which took place among the unoperated cases were several in which the ulcer was not the whole cause; thus half a dozen patients died from pneumonia, 1 with abscess of the pancreas, 1 with pyonephrosis, 1 with pyopneumothorax, and

[1] Read before the Association of American Physicians, May 16, 1905.

3 with a subphrenic abscess. One patient had a gastroureteral fistula. In 8 of the unoperated cases and in 3 of the 20 which were operated upon, the patients died from the immediate effects of hemorrhage into the stomach, which was found at autopsy filled with blood. In 1 case, for example, the patient lost eighty ounces of blood by actual measurement during the three days that she was in the hospital prior to operation. That such a patient should die upon the operating table is no surprise, although the question might be raised as to the propriety of operating at all, for the situation is very nearly as desperate as operating for a ruptured aneurysm.

Twenty cases were transferred to the surgical division of the hospital for operation, of which 14 proved fatal and 6 were discharged as "cured." Of the 14 fatal cases, 4 presented a septic peritonitis from perforation, and were nearly moribund at the time of operation. Another, as stated above, was moribund from hemorrhage, a sixth was found to have a perforated duodenal (not gastric) ulcer, and a seventh proved fatal on the thirteenth day, a recent perforation having been disclosed at operation. No one of these 7 cases should, therefore, be considered as having any real bearing upon the operative treatment of gastric ulcer, for they all presented a forlorn hope, 2 patients dying on the table and 4 within twenty-four hours.

Among the 7 other deaths one was quite unaccountable. The patient, an Irishwoman, twenty-eight years of age, gave an acute history, including much gastric pain, hæmatemesis and melæna. She had had serious gastric hemorrhage the day before the operation, which revealed nothing abnormal. The stomach appeared normal in size; there was no cicatrix, no visible ulcer, and no hemorrhage. She rallied from the anæsthetic, but died within twenty-four hours with a temperature of 105°. The cause of death, unless it was shock, with unusual temperature, could not be determined. Another patient proved to have a general tuberculous gastritis with hemorrhage. She also died within twenty-four hours. (This case was reported to the Association by F. P. Kinnicutt in 1902.) Another patient died from shock within twenty-four hours after operation. She had been in the hospital a year before for hæmatemesis, from which she was discharged "cured."

It appears that among the 20 operated cases the medical diagnosis was erroneous five times, there being 1 case of tuberculosis of the stomach, 1 of perforating duodenal ulcer, and 3 in which no ulcer was discoverable. From a further analysis of these 195 cases it appears that operative measures can rarely be relied upon for the cure of active hæmatemesis, and that also in many cases operation was delayed until the conditions present were too serious to admit of recovery. When successful results are to be anticipated, they are to be looked for in the category of cases with adhesions, cicatrices, and stenosis chiefly, and in operation such as gastro-

enterostomy performed between, rather than during, attacks of hæmatemesis. In 2 private cases the only operation consisted in separating adhesions which bound the base of an ulcer near the pylorus to adjacent structures (the pancreas, intestine, etc.), and the stomach was not opened. Both patients have remained in the best of health, one for five and one for four years. One is a woman forty-eight years of age who, four years prior to operation, nearly lost her life through excessive hæmatemesis, and suffered constantly thereafter from gastric pain and distress, with almost constant nausea and frequent vomiting. She refused my entreaties to submit to operation until she was so feeble as to make it a last hope, and she so nearly died upon the table that gastroenterostomy was not performed. The adhesions covered the base of an enormous ulcer, 5 by 3 inches across, and bound the stomach to the diaphragm and duodenum. For several days after operation violent hæmatemesis occurred, but none has taken place since, and, as stated above, the patient at present, after five years, is in robust health, eating any sort of food in reason. Prior to operation, for a long time I was able to distinguish two varieties of pain, one apparently referable to the ulcer, and another which appeared to be due to adhesions, and was excited by peristalsis induced by natural movement of the bowels and catharsis, by forced diaphragmatic movements, and by manipulations of the thin abdominal wall, especially by coughing while deep abdominal pressure was made against the diaphragm. The operation proved the correctness of this distinction, one which I have been able to make in several other cases. A third case was that of a woman who had been under my observation for half a dozen years with symptoms of moderate gastric dilatation. She never at any time presented any of the symptoms of gastric ulcer, yet when a gastroenterostomy was performed the cause of the dilatation was found to consist in a pyloric ulcer with cicatrization, which greatly narrowed the orifice. I will cite only two other personal cases in illustration of the difficulties which may attend diagnosis of gastric ulcer, even in the presence of hæmatemesis. In one of these cases the patient was operated upon for persistent hæmatemesis with a typical history of gastric ulcer. A small peptic ulcer $\frac{3}{4}$ inch in diameter was found near the pylorus, bleeding actively from its round periphery; considerable blood was also found in the stomach; the ulcer was excised and the patient made a complete recovery. The other case in contrast was clinically even more complete, yet the operation revealed nothing. The patient, a woman thirty-eight years of age, gave a classical history of gastric pain, epigastric tenderness, distress after eating, repeated attacks of hæmatemesis, with increasing weakness and emaciation, symptoms which lasted through many months. During a fortnight's stay in the ward the patient had serious attacks of hæmatemesis, and as there was no improvement under medical treatment, I advised

operation. The stomach was opened and the surgeon who operated explored the interior thoroughly with an electric light; the mucosa appeared slightly granular and congested, but there was no hemorrhage, no cicatrix, and no sign of any ulcer. The incision was therefore closed, and the patient died three days later from exhaustion following repeated vomiting. Hence, it sometimes happens that diagnosis of the *exact* condition is extremely difficult as between hemorrhage from a circumscribed ulcer which may be cured by operation and that from a generally congested mucosa which may not be so cured. In none of the cases cited in this study has the chemical analysis of gastric contents proved of determining value, for the results have been too variable, not rarely in the same patient on successive days ranging from anacidity to hyperacidity. Additional difficulty is encountered in the variability and inconstancy of all the so-called "cardinal symptoms," and in fact that any one symptom, such as pain, vomiting, or tenderness which has been present steadily for a long time, may spontaneously disappear or give place to another.

I am not yet prepared to accept a definite clinical classification of gastric ulcer into acute and chronic types based upon hæmatemesis, as attempted by Moynihan, Samuel and W. Soltan, and others.

This classification is based chiefly upon the fact that a number of cases occur in which there is a sudden single hemorrhage followed by complete and permanent recovery under medical treatment, whereas, with chronic ulcers there may be repeated small or large hemorrhages and other gastric symptoms recurring at intervals through months or years. Of course, if a patient has a single severe hemorrhage, without protracted previous symptoms, and never has any further symptoms after recovery, the case may be styled "acute," but many chronic cases of which I have records begin in this acute manner. One of the operated personal cases described above was of this type. Again, there may be no hemorrhage and the patient may yet die of perforation.

For these and similar reasons it does not appeal to me to accept a hæmatemetic basis of classification. In other words, a single large hemorrhage may denote a chronic ulcer, equally with an acute one. After all, the important difficulty lies not in trying to separate the gross ulcers into varieties, but in differentiating such cases as the three operated upon at the Presbyterian Hospital in which no gross lesion was found, *i. e.*, the cases of diffuse punctate hemorrhage. These cases suggest those of early hæmoptysis without discoverable bronchial ulceration, and the early hemorrhage of typhoid fever which arises during the congestive stage, before the ulcers are well defined. They also resemble those cases of hæmatemesis which result from congestion in chronic endocarditis and hepatic cirrhosis with portal obstruction, yet no such lesions are found to explain them.

I have not attempted to trace the after-history of the patients who were discharged from the hospital as "cured" cases of hæmatemesis, for owing to the peculiar social conditions existing in New York this is well-nigh impossible. The great majority of hospital cases occur among young women, many of them foreigners, who belong to the social order of domestic servants, seamstresses, factory, operatives, etc. They constitute a floating population to a large extent, and are constantly changing their address, for the servants change their employers, and others rarely occupy the same lodgings for more than one or two consecutive years. If a subsequent attack of hæmatemesis occurs, the patient is quite likely to go to a different hospital, nearer perhaps to a changed residence. It would not be possible to trace successfully the after-history of more than 10 per cent. of this series which extends over a period of sixteen years, and partial statistics of this sort are decidedly misleading.

A better result is obtained, I think, by reviewing the past records derived from the patients on admission to the hospital, many of whom give a history of repeated attacks extending over a period from one or two, to a half dozen years or more, showing that a complete or permanent cure is comparatively rare. Among the cases discharged as "cured" were some in which repeated hæmatemesis had occured during five to six years

To estimate the mortality of gastric ulcer by statistical methods is liable to misinterpretation. For example, J. W. Russell[1] states that 42.6 per cent. of patients recover.

To say that more than 55 per cent. of patients with hæmatemesis received into the Presbyterian Hospital (111 cases out of 195) were discharged as "cured" is of little prognostic significance, for they might nearly all die within from one to six years of hemorrhage, perforation or other complications, and I do not think any patient should be regarded as "cured" unless an interval of at least five years of health shall have followed the attack, and even in such cases the diagnosis may have been wrong, and the original hemorrhage due to congestion, punctate erosions, chlorotic anæmia or other cause, and not to peptic ulcer.

It is admitted that the cases studied for this review do not appear perhaps to make a very strong argument in favor of operation, but many came under operation too late, and most were operated upon before the recent advances in the technique of gastric surgery.

On the other hand, a total fatality of 41 cases among 195 and a possible much larger mortality among those which have not yet run their course, should constitute a plea for earlier surgical intervention in fairly typical cases.

The mortality from cases of gastroenterostomy for gastric ulcer appears to be gradually lessening under improved technique.

[1] Lancet, January 30, 1904.

Thus, in 1897 von Mikulicz[1] gave it as 16.1 per cent. for 238 collected cases, and in 1900 Mayo-Robson[2] gave practically the same figure, 16.4 per cent. for 188 collected cases, for all complications except active hemorrhage and perforation, and a year later the mortality rate for his own cases was only 5 per cent. B. G. A. Moynihan's[3] figures are 153 gastroenterostomies for ulcer with only 2 deaths, and in 22 cases of gastric hemorrhage which apparently would have soon proved fatal there were 19 recoveries after operation.

Joseph A. Blake, in an article upon "The Surgical Treatment of Gastric Ulcer," published December, 1904, in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, states his opinion "that a single large hemorrhage, without previous symptoms referable to ulcer, should not be operated upon, but when there have been antecedent symptoms operation should be performed." Also that " cases suffering from a recurrent hemorrhage should be operated upon."

In these views I concur and would add that those chronic cases also should be operated upon in which the patient's life is either made miserable through pain or endangered through persistent vomiting and emaciation, provided medical treatment tried for two or three weeks has failed to produce any improvement. Let the surgeon be given the advantage of dealing with cases not already made almost hopeless through anæmia, ulcers on the verge of perforation or complicated by a mass of perigastric adhesions. To offset these grave dangers early operation (gastroenterostomy) offers freedom from further hemorrhage, from chronic hyperacidity, pain, traumatic irritation of the ulcer by food, motor insufficiency, and gastric dilatation. Blake makes the further assertion that in the early operative cases the patient may be subjected to less shock than in most cases of appendicitis.

Some additional data derived from a series of 107 cases occurring during the past eight years may be of interest as bearing more or less directly upon the subject and the possibilities of operative interference. Although the ages of the patients range from seventeen to sixty-nine years, 51, or nearly one-half of this series, occurred between the twentieth and thirtieth year, and were observed as follows:

Seventeen to twenty years, 10 cases; twenty to thirty years, 51 cases; thirty to forty years, 34 cases; forty to fifty years, 7 cases; fifty to sixty years, 5 cases.

Of the 28 cases among males, more than one-fourth occurred among those whose occupations predispose to metal poisoning. Thus there were 3 coppersmiths, 2 printers, 3 painters, and 1

[1] Centralbl. f. Chirurgie, 1902, 1897, p 69.
[2] Philadelphia Medical Journal, May 25, 1901, p. 1005.
[3] British Medical Journal, April 8, 1905.

pianomaker. All but 8 were more than thirty years of age. Some years ago I lost a patient from foudroyant hæmatemesis, a man forty years of age, who for three years had taken large quantities of arsenic. A physician had prescribed it for chronic acne and eczema, and the patient, unaware of its baneful effect, had continued its daily use upon his own responsibility. The hemorrhage was the only symptom of ulcer, but it proved fatal during one night and I attributed it to a probable ulcer from this form of metal poisoning.

To the above list of 195 cases may be added 6 which occurred in Bellevue Hospital during the past year, of which 3 were males and 3 females. Of these 1 was cured, 1 improved, 1 died of hemorrhage, and 3 were unimproved—All had hæmatemesis. The ages of the three males were respectively forty, forty-one, and fifty-one years. In January of this year two more cases occurred among males.

One patient, thirty-six years of age, was discharged improved after hæmatemesis, and one fifty-four years of age died after operation with perforation of pyloric ulcer. He had no hemorrhage at any time (he was a painter). .

(The 8 cases, added to the previous 195, make a total of 203 hospital cases.)

The influence of social status upon the etiology of gastric ulcer is well exemplified in a comparison of the records of Bellevue and the Presbyterian Hospitals for the year 1904. In Bellevue, with 17,765 medical cases treated during that year, there were only 6 cases of gastric ulcer in the entire service, one of the four divisions having none at all—approximately 1 case in 3,000. In the Presbyterian Hospital, with 1218 medical cases treated, there were 15 of gastric ulcer, a proportion of 1 case in 80. In Bellevue, with 7595 surgical cases treated, but one operation was performed for gastric ulcer (which proved to be a complication of carcinoma), against 1925 operated cases in the Presbyterian Hospital, with 4 for gastric ulcer. The majority of gastric ulcers occur among the servant-girl and seamstress class, patients who are more likely to seek private than municipal hospital relief, either from a species of natural selection or because their well-to-do employers are in the habit of contributing to the financial aid of private hospitals; hence they become interested in them and refer their dependents to them. The municipal Bellevue Hospital abounds in cases of alcoholic gastritis, gastric carcinoma, syphilis, arteriosclerosis, privation and starvation, yet these prove to be comparatively infrequent etiological factors. There were 144 cases classed as "gastritis" in Bellevue in 1904. What is there in the dietetic or other habits of life of the serving-woman class that predisposes to this definite lesion of the stomach wall? It can hardly be their frequent diet of tea and toast, nor tight lacing (Rasmussen); yet what is it? I raise the question as an interesting one, but cannot answer it.

I have examined also the records of cases treated at the Cornell Dispensary since its foundation five years ago. There have been in the General Medicine Clinic alone 13,500 cases, with only one of gastric ulcer—a male, a metal polisher, forty-nine years of age. He had had gastric symptoms for eight months, including hæmatemesis. I was greatly surprised by these data, the more so because Dr. William Armstrong, of my staff, has for several years devoted his time to making analyses of stomach contents as an aid to diagnosis. He reports that among 150 cases lately studied he has not once been enabled to make the diagnosis of gastric ulcer.

These data are of interest in showing the relative frequency of occurrence of gastric ulcer among certain classes of the community.

FINAL NOTE ON CASE II. OF ANGIONEUROTIC ŒDEMA.

By Roger S. Morris, M.D.,
INSTRUCTOR IN MEDICINE AT THE UNIVERSITY OF MICHIGAN, ANN ARBOR.

(From the Clinic of Internal Medicine, Dr. Dock.)

In the November number of this Journal for 1904 report was made of two cases of angioneurotic œdema, the second of which was the more important, inasmuch as it was possible to demonstrate a simple, non-inflammatory œdema in a bit of the gastric mucosa, which had been obtained by the stomach tube during lavage after a test breakfast, just at the onset of an attack of nausea, vomiting, and pain. The occurrence of exitus in this case is worth recording, as it resulted from a characteristic, though somewhat infrequent cause.

For the sake of convenience the more salient points in the patient's history may be recalled. The patient, a male, was twenty-one years of age in the fall of 1903, when he was admitted to the University Hospital because of swellings of the hands, legs, and larynx, and "stomach trouble." The mother of the patient has transient swellings of the hands, and one sister suffers from œdema of the face after trauma. Otherwise the family history is negative. The patient had "mumps," "measles," and "chicken-pox" in childhood, with good recovery in each instance. He first noticed a swelling in the hands when he was twelve years old. It usually disappeared within forty-eight hours. Later, swellings appeared in the feet, knees, and elbows, the scrotum and penis. At the age of seventeen the patient had "scarlet fever" with "nephritis," and at the same time he had an attack of "œdema of the glottis," for which tracheotomy was performed. He was unconscious at this time. He was

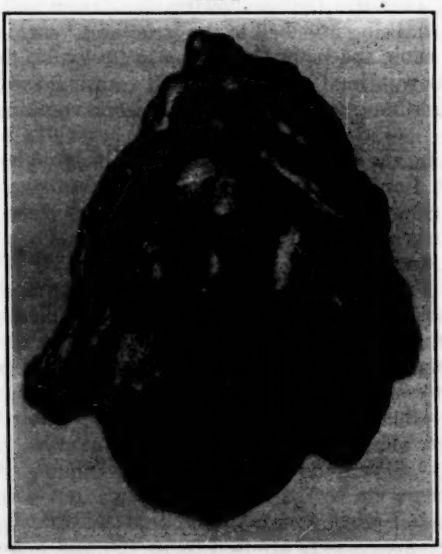
confined to bed for three weeks after the operation, during which time he says his temperature once reached 106°. It was about two months before the tracheotomy wound healed; previous to its healing there was a discharge, with a "fierce" odor, from the wound. His throat at this time was so sore that he could eat no solid food. After recovering from this illness the patient was in fairly good condition, except for occasional swellings, until April of 1903, when he had another attack of œdema of the larynx. This came on in the morning. At noon he was unable to eat any dinner, and at 6 P.M. of the same day he was unconscious. A second tracheotomy was performed. On July 13, 1903, the patient noticed a swelling "under the shoulder-blade" on rising in the morning. He was aware of swelling in the throat about 4 P.M. After supper he gradually became worse until midnight, when intubation was tried. This failed, and a trocar was thrust into the trachea. The patient was confined to bed five days at this time. About the middle of August he again had symptoms of œdema of the larynx, which subsided with steaming. Dr. Dock examined his larynx October 24, 1903, and dictated the following note: Larynx is small; epiglottis straight, but curled from side to side. Interarytenoid space deep. Entire mucous membrane red and slightly swollen. False vocal cords project inwardly, almost covering the true cords in phonation. Cords slightly red. Trachea small, moderately congested. Neck shows a scar about 3 cm. long, the width varying from ¼ to 1¼ cm.; skin pinkish over it. On swallowing, the lower half of the scar moves upward, being attached to the structures beneath. While in the medical clinic the patient's voice was husky, so that he could not speak above a loud whisper; he had transient swellings in the extremities, and an attack of nausea, pain, and vomiting, alluded to previously.

Since leaving the hospital the patient has been under the care of Dr. Floyd H. Randall, to whom I am indebted for the notes on his subsequent condition. Since the autumn of 1903 the patient has had two attacks of œdema of the larynx, the second of which proved fatal. The first occurred on July 15, 1904. Dr. Randall was called about 10.30 P.M., and found the patient extremely dyspnœic and somewhat cyanotic; he inspired with great difficulty. A hypodermic injection of one-quarter of a grain of morphine was given; he was gradually relieved after about three hours. Because of the patient's distress, examination of the larynx was not possible. The swellings on other parts of the body, especially after blows, were very frequent, more so during the last few months, the patient's father thinks. The fatal attack occurred January 3, 1905. It must have come on very acutely, for the patient was apparently as well as usual when the family retired for the night. About midnight the parents were aroused by an unusual noise, and going to the patient's room found him propped up in bed, the front of

FIG. 1

Photograph of fresh preparation showing larynx and neighboring tissues and organs from Case II. of angioneurotic œdema. Extreme œdema.

FIG. 2



Photograph of fresh preparation showing larynx and neighboring tissues and organs from Case II. of angioneurotic œdema. Extreme œdema.

his night-shirt covered with blood. Dr. Randall was summoned at once, but exitus had already occurred when he arrived.

Before going on to a consideration of the autopsy findings, it may be well to include the additional valuable points in the family history furnished by Dr. Randall. He tells me that another child of the patient's mother "choked to death" very suddenly when about two weeks old. During the past few months, and especially since the death of the patient, the mother has shown more numerous evidences of angioneurotic œdema, from which she has suffered more or less since childhood. She has never had any throat symptoms.

FIG. 3

Photograph of fresh preparation showing larynx and neighboring tissues and organs from Case II. of angioneurotic œdema. Extreme œdema.

The swellings have been noticed on the limbs and face. Of late her neck has been inclined to swell.

Autopsy was performed on the patient some hours after death. Permission was obtained to examine only the respiratory tract. The mouth and pharynx were filled with blood. The sternum was removed; the lungs showed no special change. The walls of the pharynx, the tongue, larynx, trachea, and upper part of the œsophagus were removed *en masse*. The larynx presented a most extreme grade of œdema, which involved the epiglottis, the arytenoepiglottidean folds, and the false and true vocal cords, the ventricle

being obliterated; in fact, there was the most intense œdema of all the loose laryngeal tissues above the true cords. Below the latter there was no evidence of œdema. The tissue at either side of the arytenoepiglottidean folds was also markedly œdematous. It is an interesting fact that no trace of scar from the tracheotomy wounds can be found in the trachea. The accompanying photographs, taken from the fresh specimen by Dr. C. H. Baker, illustrate beautifully the condition found.

In concluding this brief note I wish to express my thanks to Dr. Dock for his kindness in placing the specimen, which was sent to him, at my disposal for this report; while my indebtedness to Dr. Baker, and especially to Dr. Randall, is obvious.

EXAMINATION OF THE BLOOD IN PULMONARY TUBERCULOSIS, WITH SPECIAL REFERENCE TO PROGNOSIS.

By Josephus T. Ullom, M.D.,

AND

Frank A. Craig, M.D.,

of Philadelphia.

(From the Laboratory of the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis, Philadelphia).

Historical.—The blood in tuberculosis has for many years been the subject of investigation by many different observers. Among the first series of clinical examinations of the blood we find cases of tuberculosis recorded, as these earlier reports were based upon methods of examination so different from those now in use and the details of the condition of the patient are so commonly omitted they are of very little service for comparison with the more recent examinations.

In tuberculosis we have such a chronic condition, one which presents so many different phases, types and complications, and which may affect so many organs, that it is not to be wondered at that the results of blood examinations by different observers vary so widely. It is, therefore, only by taking the statistics, classifying the findings in different types of tuberculosis, and studying them in relation to one another that we can hope to derive any information of value for diagnosis and prognosis.

Hæmoglobin. As this was the first component of the blood to be studied quantitatively for clinical purposes we find a large

series of estimations of this element. The methods varied greatly from the spectroscopic to the purely chemical, which renders the results hard to correlate. That the hæmoglobin is constantly reduced in bone tuberculosis has been shown by Vierordt, Lacker, Bierfreund, and Dane. That, on the other hand, this reduction is not constant in pulmonary tuberculosis of various grades is shown by Leichtenstern, Gnezda, Barbacci, and Oppenheimer, who found fairly numerous cases in which the hæmoglobin was above normal. Quinquaud, Wiskeman, Laache, Neubert, Reinert, v. Noorden, Biernacki, Strauss, and Rohnstein, and Stevens found a decrease in hæmoglobin of varying degree in all cases. In those instances in which the cases have been grouped according to Grawitz's system we find the hæmoglobin is given as follows: Group I.: v. Limbeck, Ewing, and Swan, decreased; Appelbaum, decreased or normal; Cabot, increased or normal. Group II.: Cabot and Swan, reduced; v. Limbeck, Appelbaum, and Ewing, normal or approximately so. Group III.: All the writers found it reduced. The majority, therefore, found it reduced in Group I., normal in Group II., and reduced again in Group III. The amount of reduction varied greatly in the different reports. In regard to the high hæmoglobin finding in Group II. we will refer again in considering the red corpuscles.

Erythrocytes. Andral, Sörenson, Pick, v. Noorden, Zappert, Biernacki, Strauss and Rohnstein, and Claude and Zaky found a constant reduction of the red corpuscles in tuberculosis of various stages. Becquerel, Melassez, Laache, Neubert, Reinert, Cabot, and Da Costa found the decrease was not constant, as in some of the cases the count was normal or above normal. The most marked decrease was in a case reported by Melassez, in which the red cells were as low as 980,000. Oppenheimer believes the count is normal in this condition and only reduced by hæmoptysis. Dane, in bone tuberculosis in children, found the reds, as a rule, not reduced. Where the cases are classified we find the following: Group I.: v. Limbeck, Strauer, Grawitz, Halbron, and Swan give a reduction in the red cells; Stevens, Appelbaum, and Ewing believe they are reduced frequently, but may be normal. Group II.: All the observers give a normal or increased count except Swan and Halbron, the former, however, finding it sometimes increased; Halbron found it constantly decreased. In Group III., all the above investigators found the red cells reduced except Swan, who found them generally much reduced, but increased in 3 out of 15 cases. The evidence in regard to the red corpuscles points to the fact that in cases of infiltration or cavity formation with hectic fever, especially the latter, they are decreased in number. That in cases with cavity formation without fever or complications, and occasionally also in the other two groups, we have a normal or even increased count. This peculiar and striking condition was explained by the earlier

writers by concentration of the blood, and this has been confirmed by later research.

Different observers have given profuse expectoration, sweating, and diarrhœa as causes for the production of this concentration. They commonly, however, found cases in which none of the above causes were present. The experiments of Gärtner and Römer have shed new light on the subject and their deductions have been generally accepted. They show that the extracts of the tubercle bacillus produced an alteration in the relations between the blood-vessels and the tissues in the interchange of lymph, with an excess in favor of the tissues. The findings of Oliver may also have some bearing upon this phenomenon.

The most striking feature that we find in all the reports, in connection with the erythrocytes, is the almost constant disproportion between the red cells and the hæmoglobin. All the observers mentioned above found a greater diminution of the hæmoglobin except Oppenheimer and Biernacki, and in addition to those mentioned Hayem, Huard, Cornil, Hanot, Trousseau, Gilbert, and Labbé have specially referred to this very constant finding. Sörenson was the first to point out the striking similarity of the blood in tuberculosis and chlorosis and Labbé has recently considered the subject in detail.

In regard to the prognosis based on the blood findings one must be very cautious, as numerous observers have found the erythrocytes and hæmoglobin increase in cases which were developing general tuberculosis and advancing toward a fatal termination.

The literature is very meagre upon the microscopic changes in the red corpuscles. Anisocytosis, poikilocytosis, and nucleated reds are rarely found, the last being very infrequent even after hemorrhage. Maragliano believes the presence of polychromatophilia has an unfavorable prognostic significance even in cases otherwise apparently favorable.

Leukocytes. The results in numerous observations upon the number of leukocytes are quite uniform, although the line between different groups is not sharply drawn. The earlier observers, Sörenson, Halla, and Reinert found the white cells were generally increased, and in advanced cases were occasionally low. Pick, Rieder, Warthin, v. Jaksch, Galbraith, and numerous others have found the counts in pure tuberculosis without complications were always normal or even low. Among those who have classified their cases we find that Strauer, Appelbaum, Grawitz, and Halbron all found an absence of leukocytosis in Group I. The leukocytosis increases in Groups II. and III., depending upon the degree of mixed infection. The significance of leukocytosis in tuberculosis is best summed up in Ewing's conclusion that "In pulmonary tuberculosis an increase of leukocytes is usually referable to suppurating cavities, advancing pneumonia, severe anæmia, or hæmoptysis."

Varieties of Leukocytes. As the actual number of leukocytes has proven of so little value from a diagnostic standpoint, especially in early cases, an attempt has been made to derive some information from the relative number of the different varieties of cells. We are here confronted with a great many reports differing greatly, not only on account of different groupings of the cases, but also on account of different classifications of the leukocytes. Einhorn and Neubert both found the polymorphonuclears in excess in various stages. The consensus of opinion among the more recent observers is that where we have leukocytosis in tuberculous cases we have a relative increase of the polymorphonuclears. Appelbaum noted an increase of the transitionals accompanying the rise of polymorphonuclears. Ewing and Halbron found in acute and most chronic tuberculosis the large mononuclears in excess. Galbraith found an increase of large mononuclears under rich proteid diet, and Strauss and Rohnstein received the impression that with the progress of the disease the mononuclears showed a tendency to fall.

As the eosinophiles have attracted special attention in tuberculosis we have decided to consider them separately. Cabot does not consider their presence or absence of much significance. All the other observers consider them of some prognostic importance. Zappert found them decreased in febrile cases with an increase subsequent to, or occasionally before, the disappearance of fever. That they were absent or only few in number in severe cases was noted by Holmes, Warthin, Appelbaum, and Swan. On the other hand, that they were present in early cases or reappeared under treatment has been remarked by Claude and Zaky, Appelbaum, and Galbraith. Halbron thought they indicated the resistance of the organism to the infection. Teichmüller considered their appearance in the sputum in large numbers to be a favorable sign.

Experimental tuberculosis, to which one would naturally look for confirmation of the clinical finding, has unfortunately not proven as constant and satisfactory as one could wish. Achard and Loeper found a relative increase of the mononuclears in acute tuberculosis and in those cases associated with serous effusion. They found in animals inoculated with tubercle bacilli a primary leukocytosis which subsided in a few days, being followed by an increase in the mononuclears, the eosinophiles reappearing more slowly. Claude and Zaky found the eosinophiles appeared in the beginning of the infection and disappeared rapidly in acutely advancing forms, but remained for a long time in the circumscribed fibrous types. They noted especially the presence of transitionals and large mononuclears in those cases which supported the infection well.

The injection of tuberculin for diagnostic purposes corresponds in its blood changes to the results of experimental tuberculosis. All the observers, Bischoff, Rieder, Botkin, and Rille, found a transient leukocytosis which was followed by an increase of the

eosinophiles even as high as 10 per cent., as reported by Bischoff. This observer also noted an increase of mononuclears and transitionals directly after the injection.

The morphological changes in the nuclei and protoplasm of the leukocytes have been studied by Holmes and by Arneth. They have both attempted to derive information from the degenerative changes in the white cells upon which to base not only the prognosis but also the diagnosis of tuberculosis. Neusser found his perinuclear granules (artefacts) in cases which tended to improve.

The following is a report of observations on the blood in 39 cases of pulmonary tuberculosis, in the wards of the Henry Phipps Institute, by the writers, who were assisted in the early part of the work by Dr. Nisbet, of Philadelphia.

In tabulating our cases we have used the Grawitz system, which divides the cases into three groups. Group I.: Infiltration, with no signs of cavity. Group II.: Those having cavity formation, with little or no fever (the original classification also states "and no complications" in this group; as we had only one case of laryngitis, No. 2056, and three with slight intestinal symptoms, Nos. 2056, 2388, and 2919, we have included them in this group). Group III.: Cases with cavity formation and a hectic type of temperature. We have further subdivided each group into "favorable cases," "stationary cases" and "fatal cases," under the last heading including two cases which were rather rapidly declining. The stationary cases are also unfavorable, as they have not improved under favorable circumstances.

HÆMOGLOBIN. ORIGINAL COUNTS.

	I.	II.	III.	I.	II.	III.
40-45	0	1	0	.....	2388	
45-50	0	0	0			
50-55	0	0	1	.....	.....	2843
55-60	0	0	4	.....	.....	2650, 106, 2087, 2672
60-65	0	1	1	.....	2957	78
65-70	1	3	1	2827	3101, 2923, 3060	2737
70-75	3	3	0	2683, 2799, 1694	2056, 3005, 2826	
75-80	1	3	2	951	2760, 1975, 2919	2478, 2879
80-85	3	1	0	1950, 2984, 2758	2266	
85-90	0	3	1	.....	3015, 2674, 2676	1554
90-95	0	3	2	.....	2632, 3065, 2764	388, 3054
95-100	0	0	1	.....	.....	3079

I.	Maximum	84	1950	Minimum	66	2827	Average = 74.8
II.	"	90	3065, 2764, 2632	"	40	2388	" = 75.6
III.	"	100	3079	"	50	2843	" = 70.6

The hæmoglobin in Group I. is quite constantly moderately reduced, averaging 74.8 per cent. In Group II. we find a very slight increase in the amount of hæmoglobin, in the general average, to 75.6 per cent.; in this group, however, we find a great variation in the amount, just as we do in Group III. In the latter we find a decrease in the average to 70.6 per cent., which would be more marked if it were not for three fatal cases which had a very high hæmoglobin percentage. It will be noted that the difference in hæmoglobin in the three groups follows very closely the changes in the red corpuscles.

ERYTHROCYTES. ORIGINAL COUNTS IN THIRTY-NINE CASES.

	I.	II.	III.	I.	II.	III.
2,500,000-3,000,000	0	0	1	.....	.....	73
3,000,000-3,500,000	0	1	2	.....	3101	2660, 2843
3,500,000-4,000,000	1	0	5	951	.....	2478, 106, 2087, 2879, 2672
4,000,000-4,500,000	3	4	0	2683, 1950, 2827	3005, 2056, 3060, 2676	
4,500,000-5,000,000	4	9	0	2984, 2758, 2799, 1694	2826, 3015, 2923, 2266, 2632, 1975, 2674, 3065, 2388	
5,000,000-5,500,000	0	3	3	.....	2919, 2957, 2764	1554, 3054, 2737
5,500,000-6,000,000	0	1	2	.....	2760	3079, 388

I.	Maximum	4,930,000	2758	Minimum	3,920,000	951	Average = 4,510,000
II.	"	5,550,000	2760	"	3,250,000	3101	" = 4,630,000
III.	"	5,870,000	3079	"	2,950,000	73	" = 4,297,000

HÆMOGLOBIN OR COLOR INDEX. ORIGINAL COUNTS.

	I.	II.	III.	I.	II.	III.
0.30 to 0.40	0	0	0			
0.40 " 0.50	0	1	0	.....	2388	
0.50 " 0.60	0	0	0			
0.60 " 0.70	0	1	1	.....	2957	2737
0.70 " 0.80	4	6	3	2683, 2827, 2799 1694	1975, 2760, 2826, 2923, 3060, 2919	2843, 2087, 2672
0.80 " 0.90	2	3	6	2984, 2758	3005, 2056, 2266	2660, 1554, 106, 388 3054, 3079
0.90 " 1.00	2	5	2	951, 1950	2632, 3015, 2674, 3065, 2764	2478, 2879
Over 1.00	0	2	1	.....	3101, 2676	73

I.	Maximum	0.95	951	Minimum	0.73	2799	Average = 0.826
II.	"	1.05	2676	"	0.42	2388	" = 0.823
III.	"	1.01	73	"	0.60	2737	" = 0.831

In considering the number of erythrocytes we find that in Group I. the 8 cases ranged between 3,920,000 and 4,930,000 with an average of 4,510,000. The 18 cases in Group II. varied between 3,250,000 and 5,550,000, averaging 4,630,000. In Group III. 13 cases gave from 2,950,000 to 5,870,000, average 4,297,000. We find, therefore, in Group I. a mild anæmia, in Group II. the average is higher, and that in Group III. we have two distinct divisions of cases, those with a distinctly low count mainly made up of "stationary cases," and a group in which the counts are quite high, almost entirely made up of "fatal cases." The average for this group is lower than either of the preceding groups. In only one instance, Case 1694, was a single normoblast noted.

The study of the color index or the relation of the red corpuscles to the hæmoglobin gives very striking figures. In all three groups the color index averages practically the same and this average is distinctly below normal. In Group I. none of the cases reach normal, ranging between 0.73 and 0.95, averaging 0.826. In Groups II. and III. we have a much wider range in the figures, 3 cases going above 1 and 3 falling below 0.70; the average for Groups II. and III. being 0.823 and 0.831 respectively.

LEUKOCYTES. ACTUAL COUNTS.

	I.	II.	III.	I.	II.	III.
6,000 to 7,000	2	0	0	951, 2799		
7,000 " 8,000	1	1	0	1950	3060	
8,000 " 9,000	1	2	2	1694	2632, 2919	2672, 388
9,000 " 10,000	0	3	0	.....	2266, 2388, 2957	
10,000 " 11,000	1	1	3	2984	2676	1554, 3054, 2879
11,000 " 12,000	0	2	0	.....	2760, 1975	
12,000 " 15,000	2	3	2	2758, 2827	3015, 2923, 2674	2478, 3079
15,000 " 20,000	1	6	5	2683	3005, 3101, 2826, 2056, 3065, 2764	106, 2843, 2087, 2737, 78
Over 20,000	0	0	1	.....	.....	2660 (empyema)

I.	Maximum	16,440	2683	Minimum	6,100 2799	Average = 10,285
II.	"	19,200	2056, 2764	"	7,600 3060	" = 12,772
III.	"	20,640	2660	"	8,800 388	" = 14,041

The leukocytes show marked variation in all the groups, the average, however, increasing gradually from Group I. to Group III. We found no typical condition for any one group.

The differential count of the leukocytes in the stained specimen gives information which one would expect to be of value in regard to the diagnosis of this condition. The findings in the present series of cases are rather contradictory and confusing. We found that the actual number of each variety was more significant than

the relative percentage and we have therefore used it in all our considerations.

LYMPHOCYTES. ACTUAL NUMBER IN THIRTY-NINE CASES.

		I.	II.	III.	I.	II.	III.
	300 to 600	1	5	5	2799	3060, 1975, 2760 2923, 2764	2879, 1554, 2672 3054, 3079
	600 " 900	0	4	0	.....	3101, 2826, 2919, 2957	
	900 " 1200	1	4	4	2758	3015, 2266, 3065, 2676	2478, 2660, 2843, 888
Normal	1200 " 1500	3	2	0	2683, 1694, 2827	2632, 2388	
Normal	1500 " 1800	2	2	1	951, 1950	3005, 2056	2787
Normal	1800 " 2100	0	0	0			
Normal	2100 " 2400	1	0	0	2984		
	2400 " 2700	0	1	1	.....	2674	2087
	2700 " 3000	0	0	1	.....	.....	73
	Over 3000	0	0	1	.....	....	106
	Below 1200	25 %	72.5 %	70 %			
	1200 to 2400	75	22.0	7			
	Over 2400	0	5.5	23			

LYMPHOCYTES. We found in Group I. the lymphocytes were either normal (75 per cent. of cases) or subnormal. In Group II. the majority of cases (72 per cent.) showed a count below normal, as they did also in Group III. (70 per cent.). In Group II. they were increased in 5 per cent., and in Group III. in 23 per cent. of the cases. We have not been able to correlate these rather contradictory findings, except that the majority of the fatal cases were among those showing a lower count.

EOSINOPHILES, POLYMORPHONUCLEARS. ACTUAL NUMBER IN THIRTY-NINE CASES.

		I.	II.	III.	I.	II.	III.
	Below 100	1	9	6	951	3005, 2632, 2266, 3101, 2760, 3015, 2919, 2388, 2676	2478, 1554, 2843, 2672, 2879, 73
Normal	100 to 200	1	6	2	1694	3060, 2826, 2674, 3065, 2967, 2764	3054, 3079
Normal	200 " 300	3	0	2	2984, 2827, 2799	.....	2787, 888
Normal	300 " 400	2	1	3	2683, 1950	1975	2660, 106, 2087
	400 " 500	0	0	0			
	Over 500	1	2	0	2758	2923, 2056	
	Below 100	12.5 %	50 %	46 %			
	100 to 400	75.0	39	54			
	Above 400	12.5	11	0			

POLYMORPHONUCLEAR NEUTROPHILES IN THIRTY-NINE CASES. ACTUAL NUMBERS.

	I.	II.	III.	I.	II.	III.
3,000 to 6,000	5	4	1	951, 1950, 2799, 2984, 1694	2957, 2632,3060, 2266	388
6,000 " 9,000	1	5	4	2758	2388, 2919, 2676, 2760, 1975	2672, 2879, 3054, 1554
9,000 " 12,000	2	3	4	2827, 2683	3015, 2923, 2674	2737, 3079, 2478, 106
12,000 " 15,000	0	5	3	.....	3101, 3005, 2826, 2056, 3065	73, 2843, 2087
15,000 " 18,000	0	1	1	.....	2764	2660
Below 6,000	62.50%	22.22%	7.69%			
6,000 to 12,000	37.50	44.44	61.53			
12,000 " 18,000	0	33.33	30.76			

TRANSITIONALS. ACTUAL NUMBER IN THIRTY-NINE CASES.

	I.	II.	III.	I.	II.	III.
Below 300	1	0	0	1950		
300 to 600	2	1	0	951, 2758	2266	
600 " 900	1	5	5	2799	2923, 1975, 3060, 2919, 2388	73, 2672, 2879, 3079, 1554
900 " 1200	3	5	2	2683, 2827, 1694	2826, 2632, 3015, 2764, 2957	106, 2087
1200 " 1500	0	6	2	....	3101, 2760, 3005, 3065, 2674, 2676	3054, 388
1500 " 2100	1	1	3	2984	2056	2478, 2737, 2660
Over 2100	0	0	1	.....	.....	2843
Below 300	12.5%	0	0			
300 to 1200	75.0	61%	54%			
Over 1200	12.5	39	46			

LARGE MONONUCLEARS. THIRTY-NINE CASES. ACTUAL NUMBERS.

	I.	II.	III.	I.	II.	III.
Below 300	3	7	2	951, 2984, 1694	2760, 3005, 2632 2674, 3065, 2919. 2676	2672, 388
300 to 600	1	1	9	2799	3015	2478, 2660, 2087, 106, 2879, 73, 2737, 3054, 3079
600 " 900	1	3	1	2827	2923, 3060, 2388	1554
900 " 1200	1	4	1	1950	3101, 2826, 2266, 2764	2843
1200 " 1500	0	1	0	.....	1975	
1500 " 1800	1	2	0	2758	2056, 2957	
1800 " 2100	1	0	0	2683		
Below 300	37.5%	38.5%	15.5%			
300 to 600	12.5	5.5	69.0			
600 " 1200	25.0	38.5	15.5			
Over 1200	25.0	17.5	0			

EOSINOPHILE POLYMORPHONUCLEARS. Here our findings were more definite. In Group I. we found 87.5 per cent. of all cases were normal or above normal. In Group II., 50 per cent. of cases were below normal, while in Group III. the eosinophiles were never above normal. In only 3 cases of all three groups were they found above 500, and they were all favorable.

The estimation of the polymorphonuclears, transitionals, and large mononuclears showed nothing of special significance.

In 2 cases, Nos. 2683 and 73, in which there was a leukocytosis of 16,000, there was a single myelocyte noted.

In 25 of the above cases it was possible to make a second count while the patient was still in the hospital. The second counts were made after an interval of two to two and one-half months. The duplicate counts being made to see if there were any changes in the blood upon which one could base the prognosis. Of these cases 4 were in Group I., 16 in Group II., and 5 in Group III.

Cases remaining under observation. Increase and decrease referring to second count in comparison to first count. Counts made about two to three months apart.

ERYTHROCYTES.

	Increased.	Decrease.	Increase.	Decrease.
I.	951, 2683, 1950	1694	75 %	25 %
II.	3101, 3005, 2826, 2056, 3015, 2923, 2632, 3060, 1975, 2266, 3065, 2919, 2674, 2676, 2764	2760	94	6
III.	2660, 106, 1554, 2843	2737	80	20

The erythrocytes generally increase under treatment; this is true of the favorable and unfavorable alike, the increase occurring in those which are not improving as well as in those which are apparently doing very well. In the first group, however, it was noted that the one case which decreased was the only stationary one in that group and in the third group the only one to decrease was the most unfavorable one in that class. In Group II., however, they almost all increased regardless of the patient's general condition.

HÆMOGLOBIN.

	Increased.	No change.	Decreased.	Increase.	No change.	Decrease.
I.	.....	1694	951, 2683, 1950	0	25 %	75 %
II.	.....	1975, 3005, 2923, 3101, 2919	2760, 2826, 2056, 3015, 2632, 3060, 2266, 2674, 3065, 2676, 2764	0	31	69
III.	2737	2660, 2843, 106	1554	20 %	60	20

The hæmoglobin, as a rule, either remained stationary or decreased regardless of any improvement on the part of the patient. The only case in which the hæmoglobin increased was the most unfavorable one in Group III.

HÆMOGLOBIN INDEX.

	Increased.	No change.	Decreased.	Increase.	No change.	Decrease.
I.	1694	.....	951, 2683, 1950	25 %	0	75 %
II.	.....	.....	3101, 2760, 3005, 2826, 2056, 3015, 2923, 2632, 3060, 1975, 2266, 2674, 3065, 2919, 2676, 2764	0	0	100
III.	.....	2737	2660, 1554, 106, 2843	0	20 %	80

As one would naturally expect in a condition where the red cells increased in number without a corresponding increase in hæmoglobin we found an almost constant decrease in the color index.

LEUKOCYTES.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694	.....	100 %	0
II.	3101, 3015, 2923, 2632, 3060, 1975, 2266, 2919	2760, 3005, 2826, 2056, 3065, 2674, 2676, 2764	50	50 %
III.	.....	2660, 1554, 106, 2843, 2737	0	100

The leukocytes present a rather peculiar condition and one which is contrary to the usual findings. In Group I. every case showed an increase of the leukocytes under treatment. One-half the cases in Group II. present an increased count and one-half a decrease, in the latter being the majority of the unfavorable cases, and only one stationary case being found in the first half. In Group III. in every case the leukocytes were found to have decreased.

LYMPHOCYTES COMPARATIVE COUNTS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694	.....	100 %	0
II.	3101, 2826, 2056, 2923, 3060, 1975, 2266, 2674, 3065, 2764	2760, 3005, 3015, 2632, 2919, 2676	62.5	37.5 %
III.	2660, 2843	106, 1554, 2737	40	60

LYMPHOCYTES. We feel that in the actual number of this form of leukocyte we have perhaps one of the best indications upon which to base the prognosis, although it is not absolute. In Group I. we found an increase of 100 per cent., in Group II. only 62.5

per cent. increased, while in Group III. we find only 40 per cent. showed an increase in the number of lymphocytes.

EOSINOPHILE POLYMORPHONUCLEARS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 1950, 1694	2683	75 %	25 %
II.	3005, 3015, 2923, 2632, 3060, 2674, 2919, 2764	3101, 2760, 2826, 2056, 1975, 2266, 3065, 2676	50	50
III.	1554	2660, 2843, 106, 2737	20	80

EOSINOPHILES. This variety, in a general way, followed the same course as the foregoing. In Group I. 75 per cent. increased; in Group II., 50 per cent. and in Group III., 20 per cent. of the patients showed an increase of the eosinophiles, the one case being a stationary one.

NEUTROPHILE POLYMORPHONUCLEARS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694	.....	100 %	
II.	3101, 3015, 2923, 2632, 3060, 1975, 2266, 2919, 2676[1]	2760, 3005, 2826, 2056, 2674, 3065, 2764	56	44 %
III.	2843[1]	2660, 106, 1554, 2737	20	80

NEUTROPHILE POLYMORPHONUCLEARS. These follow exactly the increase or decrease in the number of leukocytes except in Cases 2843 and 2676, and in the latter one of these the increase in this variety was less than 100.

LARGE MONONUCLEARS.

	Increased.	Decreased.	Increase.	Decrease.
I.	.....	951, 2683, 1950, 1694	0	100 %
II.	3101, 2760, 3005, 3015, 2923, 2632, 1975, 2266, 3065, 2919, 2676, 2764	2826, 2056, 3060, 2674	75 %	25
III.	1554	2660, 106, 2843, 2737	20	80

LARGE MONONUCLEARS. This variety decreased in all of the first group. In Group II., in 75 per cent. of the patients, they increased regardless of the character of the case, and in Group III. 1 case out of the 5, which was a stationary case, showed an increase.

[1] Only cases in which the polys. did not correspond to increase or decrease of leukocytes, q.v.

TRANSITIONAL FORMS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694,	.....	100 %	0
II.	2923, 3060, 1975	3101, 2760, 3005, 2826, 2056, 3015, 2632, 2266, 2674, 3065, 2919, 2676, 2764	19	81 %
III.	.....	2843, 106, 2660, 1554, 2737	0	100

TRANSITIONALS. These showed a very interesting change. In Group I. they were increased in every case, while in Group III. every case showed a decrease. Group II. showed a decrease in 81 per cent. of cases. All those in this group that showed an increase of this form were improving cases.

From these examinations we would draw the following conclusions, being fully convinced, however, that the series is too limited in number and the field covered too narrow to draw deductions which could be considered by any means final:

1. In pulmonary tuberculosis without cavity formation a mild anæmia, with a decrease in erythrocytes and a relatively greater decrease in hæmoglobin, is constant.

2. From the standpoint of prognosis an increase of the erythrocytes, in cases without cavity formation, is of favorable significance.

3. In advanced cases a decrease of the leukocytes is of unfavorable import.

4. In our investigations we have received the impression that the actual increase of lymphocytes seems to correspond to the increase of resistance on the part of the organism to the tuberculous infection, but further study is required to confirm this deduction.

5. The transitionals seem to follow the same rule as the lymphocytes in this regard.

6. At the beginning of the investigation the eosinophiles seemed to increase with the patient's improvement, but further study did not support this view.

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REST IN THE TREATMENT OF LARYNGEAL AND PULMONARY TUBERCULOSIS.[1]

By W. Peyre Porcher, M.D.,
CHARLESTON, S. C.

It is a well-known fact that it is impossible to repair a watch while it is running. It is equally true that rest, partial or complete, is necessary to restore any diseased limb or impaired function or organ of the body. If the eye should be diseased we must rest that; if a limb should be wounded we must rest that; why, therefore, should we not be equally stringent that a diseased throat should be rested?

By resting the larynx, I mean total cessation of phonation, the amount of cough being limited by judicious local and constitutional treatment to the least possible quantity.

Certainly, next to violent paroxysms of cough, and perhaps exceeding them, reckless and prolonged phonation does more toward destroying the laryngeal mucous membrane than any other factor.

We have all borne witness to this truism in the cases of preachers, lawyers, singers, hucksters and all those whose livelihood depends to a greater or less extent upon vocalization.

Never will I forget the impression made upon me many years ago by a preacher whose vocal integrity had been restored by a few months' rest in a mountain region. On his return home, after describing his trip to numerous friends, preaching, etc., he became entirely aphonic, and he early filled a consumptive's grave.

It is not alone in cases of laryngeal tuberculosis that complete rest of the larynx and pharynx is indicated. In ordinary pulmonary cases efforts to phonate excite hypersecretion and contraction of the laryngeal muscles. Therefore, complete cessation of phonation will lessen the amount of cough and consequent prostration, hyperpyrexia, perspiration, etc.

It has been found that this absence of phonation does not result in ankylosis of the joints, even after a period of several months. The explanation of this fact appears to be that in ordinary respiration there is still sufficient motion to prevent it. It might be well for us to recall here that we are not concerned alone with the larynx, because we know that vocalization can be entirely destroyed by traumatism or other interference with the integrity of the pharynx.

During the respiration or swallowing the laryngeal muscles are in a state of comparative rest, but in coughing or phonation every muscle is active. Hence if the integrity of the mucous membrane of the larynx has been destroyed, rest, partial or complete, is imperative before the restorative processes might naturally be expected to set in.

[1] Read before the American Laryngological Association, June 1, 1905.

It has been urged by many writers that cough up to a certain amount should be encouraged instead of hindered, in order that the bacilli may be ejected. A limited amount of cough may be said to be unavoidable in some cases to remove accumulated excretion, but certainly it should in no wise be encouraged; first, because the patient could derive but small benefit from the ejectment of a certain number of bacilli when the tissues were left saturated with them, and second, because we cannot account for the manner in which nature absorbs or throws off the bacilli in some cases in which they appear to have disappeared.

Some sanitariums north and west have achieved great success by reliance alone upon the open-air treatment, with almost total exclusion of all local and even constitutional medication. It would appear, therefore, that if such good results were to be obtained alone by the aid of atmospheric invigoration that Nature was quite competent to take care of the bacilli; but if this is the truth, how much greater and quicker results should accrue with the aid of complete rest of the diseased organ, combined with the judicious use of anodynes, internally, and local applications to heal intractable ulcers, etc.

It has been and still is advocated by some laryngologists that in order to obtain total and complete rest, the respiratory function should be abolished by the aid of tracheotomy. This would, indeed, be ideal, were it possible to obtain such results by this measure. Unfortunately, however, apart from the infection of the wound by the bacilli, the secretions become agglutinated by the inflammatory exudates from the wound; the cough is aggravated, thereby liability to pneumonitis is set up, and the efforts to get rid of the sputa are rendered so difficult that the advantages gained are far more than offset by the disadvantages.

The great benefit derived from the non-use of the voice is so striking that no one can fail to appreciate it who watches the progress of a case. The simple effort to phonate is aggravated a thousand per cent. when the larynx is whipped up to do its normal amount of work, namely, the overcoming of the noises of travelling, other voices, and the continuous effort to do even more than is ordinarily required of it.

A patient recently under my care reported that he had been coughing over a year. He had been rooting at football games, taking part in college sports, and teaching school, with the poorest hygienic surroundings. Of five physicians who had attended him, none had urged him to discontinue the use of his voice. Severe infiltration of the entire laryngeal mucous membrane was found, but the arytenoid prominences were not enlarged, nor was there any ulceration of the vocal cords or of the epiglottis. There was marked dulness under the left clavicle, loud vesicular murmur, and engorgement at base of the left lung as a result of old pneumonia. Tubercle bacilli

were found in his sputa, and he had a temperature varying from 99° to 101°. On the slightest exertion his pulse ran up to 100 and over.

Complete cessation of phonation was exacted of him; he was given small doses of Dover's powder and quinine at night to secure sleep, and an emulsion of turpentine and ammonia, with morphine sulphide, gr. $\frac{1}{4}$ ter in die. He also took, at intervals, palmiacol, thiacol, beechwood creosote, and locally applications of formalin (10 per cent. solution) to the larynx. Occasional applications of nitrate of silver were also made to the pharynx. He was ordered to drink milk in place of water, and to eat as many raw eggs as he could assimilate.

As a result of this treatment his symptoms have all abated, he has gained flesh steadily, the laryngeal inflammation has almost entirely disappeared, and he is deeply impressed with the benefit derived from the non-use of his voice.

It is interesting to note that the improvement in this case has taken place without any special reference to climate. He has not been sent off to the mountains, nor required to sleep out-of-doors, nor to do anything else, except to keep fresh air in his room and to stay in when the weather was inclement. Had he failed to respond to this rest and conservative treatment, he would undoubtedly have left for some higher clime, as so many persons do who are deluded with the idea that their only chance of cure lies in a high and rigorous climate. Many of these unfortunates sacrifice all the care and attention which they would receive at home for the discomforts and even privations which they often find unavoidable among strange surroundings. No case of tuberculosis should be allowed to leave home unless he can get every luxury usually obtainable only by the wealthy, with the care of a skilled nurse and medical attendant.

The chief advantage which patients obtain at sanitariums which they do not get from their home physicians is that more absolute control is exerted over them. Their daily outgoings and incomings are more closely watched. For example, to exact absolute silence by a home physician would be regarded as unnecessarily strenuous treatment, even in the laryngeal cases, whereas it is no less indicated in the one than in the other.

It is astonishing how many so-called cures have been recorded of laryngeal tuberculosis by different authors and under different forms of treatment where patients were often allowed to follow their daily avocations, use tobacco, smoke cigarettes, etc., and yet no one has denied the efficacy of complete rest to the throat, or that the effect of tobacco was injurious.

Failure to observe the precautionary measure of laryngeal and bodily rest in tuberculosis during any degree of pyrexia is simply criminal. This being the case, is it not equally indicated in the apyretic stage?

By complete rest we increase the physiological power of the patient to resist the disease, and, as there is no drug or serum so far discovered which has proved to be a panacea, we are forced to rely on rest, fresh air, good food, and those drugs which we now know limit all inflammatory processes.

In conclusion, we must estimate the amount of advantage to be derived from rest and complete absence of phonation in tuberculosis of the respiratory organs. The violence and amount of cough determines the amount of injury done to these organs and the consequent amount of pyrexia. Every symptom productive of cough is at variance with a return to health. Rest, either partial or complete, should be paramount in all cases.

THE RELATION BETWEEN ANTHRACOSIS AND PULMONARY TUBERCULOSIS.[1]

By Jonathan M. Wainwright, M.D.,
of Scranton, Pa.,

and

Harry J. Nichols, M.A., M.D.,
of Washington, D. C.

We all have heard that miners have a tendency to immunity from tuberculosis, that coal dust prevents tuberculosis, and that it even has a curative effect when tuberculosis is once developed. The present article is an inquiry as to whether these ideas have any basis in fact, and if so, what is the cause.

An investigation into the relationship between any disease and an occupation or mode of life is always complex. This complexity becomes more marked when the disease in question is as intricately connected with social, sanitary, economic, racial, and other factors as is pulmonary tuberculosis. It is doubly so when the human factor to be considered is as varied as to race, habits of living, diet, intelligence, etc., as are our anthracite mine-workers.

Some general aspects of the question will to some extent account for a part of the presumed low mortality from tuberculosis among miners. We know now for instance that tuberculosis is essentially a disease of those living under crowded conditions both at home and at their work. Crowding at work is never present among mine-workers. Seldom are there more than two or three and often only one man working in a large chamber. Furthermore, the spread of infection among the men at work is practically impos-

[1] Read before the Laennec Medical Society, at Baltimore, May 22, 1905.

sible as the moisture in the mine prevents the sputum deposited from drying. The germs must either die out from lack of nutriment or be washed away by the mine waters.

Conditions above ground also favor a low tuberculous death rate among miners. While in the mining region a far too large number of foreigners will often occupy a small house, there is none of the vast overcrowding of the city tenements. A very large number of miners, at least as compared to many other trades, live with only their own families in separate, single, or double houses. Even the houses overcrowded by foreigners are separate so that the number exposed to infection from a consumptive boarder is comparatively small.

The habits of mine-workers as compared to many other working people also tend in a measure to freedom from tuberculosis. For instance, the mine-worker frequently has to walk several miles to the shaft through the fine air of high altitudes. There is comparatively little travelling to and from work in a sputum-soaked street car. Furthermore, a miner's house being generally on a small lot, his time out of the mines is much more frequently spent out-of-doors than is the case with tenement dwellers. Often some of the time is spent working in a small garden. The fact that a daily full bath is imperative also must have a marked influence on the health of miners.

It is of course a fact that for every trade a large proportion of its tuberculosis mortality belongs really to the saloon. The alcohol factor among miners probably does not differ much from that of other workers of the same social grade. These general factors cannot account for all the difference in mortality from tuberculosis among miners that really seems to exist. It is probable that there are other factors among which anthracosis seems to be important.

Before going farther it will be well to consider what evidence there is that this supposed low mortality among miners is an actual fact. One naturally turns first to statistics. In considering the statistics of a disease like tuberculosis in relation to any occupation it has well been pointed out by Miss Brandt[1] that there are two important factors to be considered as having an influence. One is whether there is for a given occupation a sort of natural selection at work by which only the stronger youths take up the occupation, so that from the start we have a more or less picked class in whom tuberculosis would naturally be rare.

Second, is it a fact that miners who have contracted tuberculosis seek lighter work, and finally, on death, are registered with this second occupation to which they really do not belong, thereby artificially reducing the true death rate among miners and swelling it in another easier trade?

In regard to the first question it does not seem that any one who is at all familiar with coal-mining people will think that the

process of natural selection works in any way to make them a picked class. Boys and men take up mining not because they are particularly strong but because it is the easiest work to obtain in the region in which they live, and it becomes in a way their natural destiny.

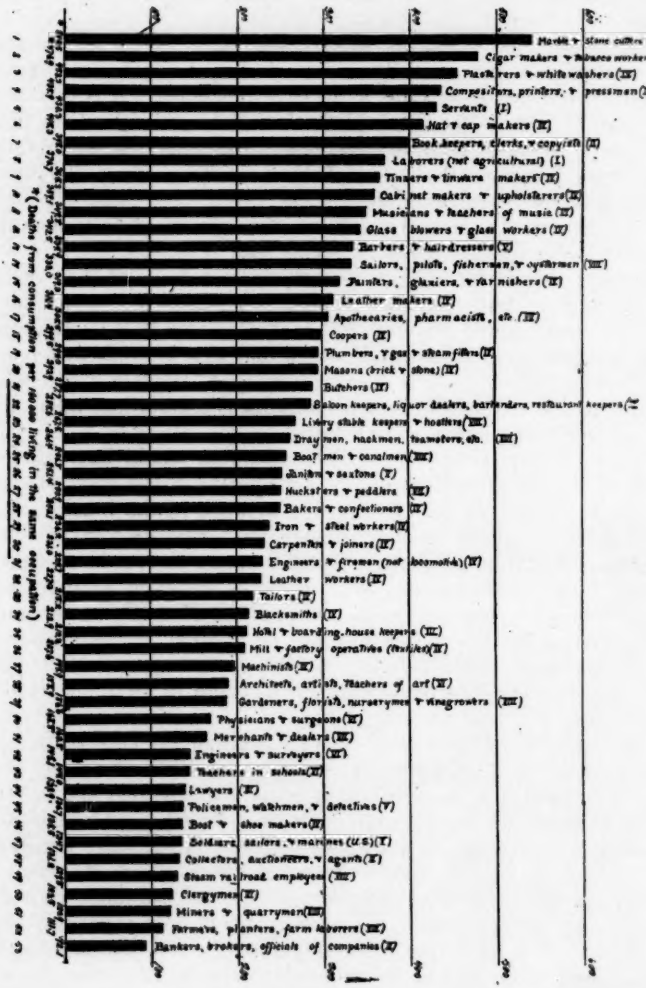
As to whether weaklings even when admitted to the mining occupations are not weeded out later it may be said that mining is not such a laborious trade as to have this effect. It is certainly not more laborious than that of the farm laborer, with whom they are nearly equal in point of tuberculosis mortality. It is certainly not more laborious than that of blacksmithing, where the mortality is about twice as high.

In regard to the second point, whether consumptive miners do not drift into another trade, it seems that here, too, there is not an appreciable factor. Most consumptives continue at their occupation so long that when they do have to give up they do not have enough strength and ambition left to start a new trade. At death they are registered in the trade which they first followed or among the "unemployed." That the "unemployed" contain many who contracted tuberculosis while in active work is unquestioned, but this factor should not balance in all trades.

We think that Schaffer,[2] of Pottsville, Pa., would have agreed with us that these two factors do not operate in the cases of coal miners. He says of the boy starting to work in the breaker that "He grows up to be a lusty, sinewy youth who seldom troubles doctors except from accident." Schaffer quotes Roy, a mine inspector in Ohio, as follows: "With currents sufficient to carry off noxious gases, smoke, and at least most of the dust, mining becomes not merely a healthy but a pleasant occupation, notwithstanding what has been said about its drawbacks . . . men who go from the farm and shops to work for a season in the mines rarely go back to their old work."

The largest collection of statistics bearing on this matter is probably that of the United States Census for 1900. In classifying deaths according to occupations it is unfortunate that the census bureau groups all miners and quarrymen together. On this account it is impossible to get for the whole United States accurate figures concerning coal-miners alone. However, it is to be remembered that all authorities consider colliers the healthiest class of miners, and all agree that stone-dust is much more injurious than coal-dust. It is therefore unquestionably true that the figures for coal-miners alone would be more favorable than those for all miners and quarrymen combined. The following comparison of this class, then, must be read with the knowledge that the comparison for coal-miners alone would be more favorable still. In the census classification from the registration area of fifty-three occupations for the census year 1900, miners and quarrymen occupy the second

place from the bottom in point of view of tuberculosis mortality. The two classes which have a lower mortality rate are: (1) farmers, planters, and farm laborers, and (2) bankers, brokers, and officials


Marble & stone cutters (IV)
Cigar makers & tobacco workers (IX)
Plasterers & whitewashers (IX)
Compositors, printers, & pressmen (IX)
Servants (I)
Hat & cap makers (IX)
Book keepers, clerks, & copyists (II)
Laborers (not agricultural) (I)
Tinners & tinware makers (IX)
Cabinet makers & upholsterers (IX)
Musicians & teachers of music (II)
Glass blowers & glass workers (IX)
Barbers & hairdressers (V)
Sailors, pilots, fishermen, & oystermen (III)
Painters, glaziers, & varnishers (IX)
Leather makers (IX)
Apothecaries, pharmacists, etc (II)
Coopers (IX)
Plumbers, & gas & steam fitters (IX)
Masons (brick & stone) (IX)
Butchers (IV)
Saloon keepers, liquor dealers, barkeepers, restaurant keepers (V)
Livery stable keepers & hostlers (VIII)
Draymen, hackmen, teamsters, etc. (VIII)
Boatmen & canalmen (VIII)
Janitors & sextons (V)
Hucksters & peddlers (VI)
Bakers & confectioners (IX)
Iron & steel workers (IX)
Carpenters & joiners (IX)
Engineers & firemen (not locomotive) (IX)
Leather workers (IX)
Tailors (IX)
Blacksmiths (IX)
Hotel & boarding-house keepers (VI)
Mill & factory operatives (textiles) (IX)
Machinists (IX)
Architects, artists, teachers of art (II)
Gardeners, florists, nurserymen & vinegrowers (III)
Physicians & surgeons (II)
Merchants & dealers (VI)
Engineers & surveyors (II)
Teachers in schools (II)
Lawyers (II)
Policemen, watchmen, & detectives (V)
Boot & shoe makers (IX)
Sailors & marines (U.S.) (V)
Collectors, auctioneers, & agents (II)
Steam railroad employees (VII)
Clergymen (II)
Miners & quarrymen (III)
Farmers, planters, farm laborers (III)
Bankers, brokers, officials of companies (II)

of companies. The rate of death for miners and quarrymen per 100,000 living in the occupation is 120.9. Comparing this with a few of the presumably more healthful occupations we see the rate for lawyers is 139.9, for physicians and surgeons 168.8, for car-

penters and joiners, 231.0; for draymen, hackmen, and teamsters, 261.4; for sailors, pilots, and fishermen, 333.1, etc. The highest in the list are marble-cutters and stone-cutters at 540.5. The rate for out-door laborers, in which miners are grouped, is 147. These statistics are graphically shown in the accompanying diagram, reproduced from the *Handbook on the Prevention of Consumption*, through the courtesy of Miss Lillian Brandt.

According to the same census report consumption caused 10.6 per cent. of all deaths among miners and quarrymen, as against 16.2 per cent. for all occupied males, and as against 10.2 per cent. for the out-door group, among which miners are included.

In the whole United States consumption caused 9.6 per cent. of all deaths among miners and quarrymen as against 14.5 per cent. for all occupied males, and as against 11.2 per cent. for the out-door group of workers. (The figures for miners and quarrymen are based on a return of 5895 total deaths from all causes.) According to this table, therefore, consumption is nearly one-third less frequent among miners and quarrymen than among other occupied males. As noted above, the rate for miners alone would be still less.

In England statistics point equally strongly to a diminished mortality from tuberculosis among miners. Tatham[3] presents a very succinct statement of the case based on figures from the Registrar-General's office for 1890 to 1892. These English statistics show that the relative figures for deaths from phthisis among coal-miners is only 97 as against 109 for all classes of miners (iron, copper, tin, lead, etc.), as against 115 for farm laborers and 185 for all occupied males.

Parry,[4] from English figures on more or less dusty occupations gives the following table of relative mortality in which coal-miners stand lowest not only in regard to consumption but also in regard to all other diseases of the lungs. In both respects they stand lower than all occupied males.

TABLE I.—PARRY (ENGLAND).

Occupations.	Relative mortality figures.		
	Consumption.	Other diseases of lungs.	Total lung diseases.
Coal-miners	126	202	328
Carpenters and joiners	204	133	337
Plumbers, painters, and glaziers	246	185	431
Masons, builders, and bricklayers	252	201	453
Wool manufacturers	257	205	462
Cotton manufacturers	272	271	543
Quarrymen, stone and slate workers	308	274	582
Cutlers	371	389	760
Filemakers	433	350	783
Earthenware makers	473	645	1118
Cornish (tin) miners	690	485	1148
All males, England and Wales	220	182	402

(Sweeps, coal-heavers, and trimmers are given higher figures than coal-miners.

We have not been able to find any large collection of French or German statistics.

In order to get some first-hand information in regard to our own anthracite mine-workers, as a class, we have gone over the death certificates on file at the Scranton Bureau of Health for ten years and have worked out the percentage of deaths from various causes, the average length of life, etc., among miners as compared with other occupied males. The years covered were the last ten, excluding 1902, the year of the long strike of over five months. A short strike of a little over a month in 1900 was ignored. With a general population of something over 100,000, Scranton has had during the above period 857 deaths among miners and 2656 deaths among other occupied males. In each case the actual certificate of the physician furnished data and only complete certificates were used.

Aside from the ever-present possibility of mistaken diagnosis, there are two special circumstances which make our results suggestive rather than mathematically absolute. In the first place, many certificates were excluded as incomplete, and a slight error may have crept in from this. It is fair to assume that this exclusion affects both groups to the same degree. Secondly, the occupation in many certificates is only given as laborers and it was possible that some mine laborers were so designated. On going over the certificates we came to regard this possibility of error as slight because mining is such a distinctive occupation that we found special reference made to it, or the context showed the exact occupation. With these qualifications our statistics are as follows:

TABLE II.—SHOWING PERCENTAGE OF ALL DEATHS WHICH ARE CAUSED BY VARIOUS LUNG DISEASES AND TRAUMA (FOR LAST TEN YEARS AT SCRANTON).

	Pulmonary tuberculosis.	Asthma.	Pneumonia.	All lung diseases.	Trauma.
Anthracite mine-workers (857 deaths)	3.37 %	7.0 %	10.96 %	23.45 %	45.57 %
All other occupied males at Scranton (2656 deaths)	9.97 %	1.58 %	13.85 %	27.86 %	14.15 %

Taking the percentage of deaths from all lung diseases among miners as 100 the relation is as follows:

TABLE III.

	All lung diseases.	Pulmonary tuberculosis.	Asthma.	Pneumonia.
Anthracite mine-workers	100	14	29	42
All other occupied males	114	41	7	54

From our own figures in Scranton it would seem that tuberculosis is about two-thirds less frequent among miners than among all other occupied males. By taking our figures of 3.3 per cent. as the proportion of all deaths among miners due to tuberculosis and

comparing it with the census figures for the whole United States we get the following table:

TABLE IV.

	Percentage of all deaths due to consumption.
Anthracite mine-workers	3.3 %
Miners and quarrymen, whole United States	9.6 "
Out-door laborers, " " "	11.2 "
All occupied males " " "	14.5 "

So far as statistics go, we will rest here. It will be of interest to note, however, that the average age at death in anthracite mine-workers from all causes is 42.89 years as against 46.36 years for all other occupied males in the same city. The average age at death from trauma is 34.15 years among the miners and 36.05 among all other occupied males. From causes other than trauma the average age at death is 49.93 for miners as against 48.05 for other occupied males. In other words, if we exclude trauma miners live slightly longer than all the other occupied males in the same city.

Now, we will examine the opinions of writers who have paid special attention to the hygiene of mining or other occupations. As early as 1863 Kubon,[5] of France, says that "coal-dust is unable to cause pulmonary tuberculosis or even to favor the evolution of pre-existing tubercles. It prevents the development of phthisis."

De Crocq,[6] Belgium, in 1862 said that several physicians had noted the rarity of consumption among coal-miners.

In Germany, Arnold[7] says: "It has been noted that among miners tuberculous diseases are very rare. It has even been considered that there is an antagonism between anthracosis and tuberculosis." Arnold disclaims any personal experience in the matter, but considers that if there is any action it is due to the fact that the deposits of dust prevent the spread of the poison. He does not believe that there is a direct action of the dust on the bacteria.

Seltman, quoted by Burger,[8] found tuberculosis a rare disease both in old and young miners. He also announced that coal-dust exerts a favorable influence on a tuberculous process already present. He says that many physicians have treated tuberculosis of the lungs by the inhalation of coal-dust.

Goldman[9] says that tuberculosis is a rare disease among coal-miners. He says it causes only 1 per cent. of deaths among them. This he attributes to an antiseptic action of the dust. Goldman quotes Hirt, who in 4000 cases of pulmonary tuberculosis found that 22 per cent. had been subject to various kinds of dust, 11 per cent. had not been subject to dust, and only 1 per cent. had been subject to coal-dust. Goldman says that tuberculosis is more prevalent among miners' families than among miners themselves. Basing our opinion on a service of over four years in a large miners' hospital, and also on a somewhat close study of the tuberculosis

problem in the largest anthracite centre in the United States (Scranton) we most decidedly agree with Goldman in this statement.

Dirksen,[10] Germany, says that coal-workers have the best health of all dusty occupations. He says that in Upper Silesia only 0.9 per cent. of all internal diseases among coal-miners are due to tuberculosis. He says that many claim a direct immunity from tuberculosis in coal-miners.

In England, Oliver,[11] of Newcastle-upon-Tyne, who is one of the greatest authorities on occupational diseases, draws a sharp line between lesions due to dust and those due to tubercle bacilli. He does not give much attention to the relative action of one on the other. He does say, however, that "ventilation of the British coal-pits has practically abolished pulmonary consumption among our miners."

Trotter,[12] of Beddingtonshire, an English coal-field, says: "As a disease, phthisis is probably more uncommon among coal-miners than among any other class of workers. . . . I am inclined to believe that the comparative rarity of phthisis among coal-miners is probably largely due to the protective influence of coal-dust or soot." He considers this partly a mechanical action due to the coal-dust and soot clinging to and covering the sharp angles of the mineral matter inhaled and "to a lesser degree to an antiseptic and deodorant action." He says that "the death returns from phthisis in a colliery district show a greater proportion of deaths among females than among males." (See Goldman's and our own opinion above.) "Colliery surgeons almost invariably state that phthisis is not so common among miners as in other districts in which they have practised."

We have been trying to add some experimental evidence to the question of the influence of anthracosis on tuberculosis, and as far as we have gone our experiments have been affirmative. Our method has been to keep guinea-pigs about two months in a box in which coal-dust is constantly stirred up. In this way quite a degree of anthracosis has been produced. We have then taken these pigs and injected a suspension of a pure culture of tubercle bacilli directly into the trachea which was exposed by dissection. In this way one can be quite sure that the tubercle bacilli actually reach the lungs. Control animals which had not been subjected to the dust were also injected in the same way with the same syringe full of suspension so that as far as possible the same dose was obtained for all. In the first series when the pigs were killed the control had extensive tuberculosis of the lungs and abdominal viscera. The anthracotic pig had extensive tuberculosis of the abdominal viscera and of the glands around the tracheal injection, but *the lungs were free.* In the second series the result was the same. Two anthracotic pigs were injected and the lungs of both were free. In the third series the two anthracotic pigs had pul-

monary tubercles, and practically the post-mortem finding did not differ from the control of the series. If, therefore, half of the pigs were protected from pulmonary tuberculosis by the coal-dust it creates a strong argument. It is not of course to be presumed that every pig would be protected. The animals thus far tested are too few to be completely conclusive, but a great deal of time will be required to get more data. The conclusion of each experimental series takes about four months. Many series have had mishaps and failed, so that many months have been lost. These experiments are being continued.

We have also obtained a similar result by injecting a suspension of coal-dust into the testicles of guinea-pigs, and later injecting the testicles with a suspension of tubercle bacilli. Pigs which had previously been injected with coal-dust lived on an average forty-nine days. The controls lived on an average twenty-five days.

Having gone as far as is now possible in demonstrating that those who have anthracotic lungs are less susceptible to tuberculosis the cause of this phenomena must be considered.

The most frequently mentioned theory is that it is due to the germicidal action of the coal-dust. We have tested the germicidal action of coal-dust by various methods on tubercle and typhoid bacilli, staphylococcus, vibrio, and several unidentified bacteria, and have found that the dust has no germicidal action whatever. It is true that if bacteria are mixed with sterile dust and allowed to remain in contact with it in a test-tube for several days and then plated a slight inhibitory influence will be observed, but even this prolonged close contact will not kill bacteria. There are also several *a priori* reasons against this germicidal action of the dust.

Dr. Nichols considers that it is possible that the soluble calcium salts which form a large proportion of the ash of coal-dust may at least play a part in the protective influence. He is now working on his theory.

Another idea has been that the rarity of tuberculosis among miners is not due to any protective influence but depends on the fact that the air of mines is comparatively free from bacteria. We have shown by tests that in the air of the chambers this is the case. The air supplied to chambers passes slowly through damp gangways sometimes a half-mile. During this passage many bacteria fall to the ground so that the air when supplied to the chambers has undergone a purification by sedimentation just as takes place in rivers. Our tests were by the ordinary Petri-dish method. The dishes being exposed at the beginning of the intake or air tunnel and again for the same length of time in various chambers. The following are two characteristic examples of results:

TABLE V.—SHOWING THE PURIFICATION OF AIR BY PASSAGE THROUGH INTAKE.

	Number of colonies on dish in three minutes.	
	Diamond mine.	Dodge mine.
Beginning of intake	880	390
Average in chambers	54	18
End of return tunnel	15	

That this bacterial purification of the air in which the miners work, together with the fact noted above that tuberculous sputum cannot dry, must have some effect in diminishing tuberculosis cannot well be doubted.

As we have said, however, it is probably not the sole factor. Our own opinion is that the coal-dust in the lungs does exert a real protective influence against the tubercle bacilli, and that it is due to the stimulating effect of the coal-dust on connective-tissue growth. This connective-tissue growth is of course the way in which nature overcomes the tubercle bacilli and anything which stimulates it will be a valuable aid in preventing the bacilli from getting a foothold or in overcoming them when once established.

That the coal dust causes this stimulation of connective-tissue growth is well known. Microscopically, anthracosis may be divided into three stages.

The first is seen in those who have worked in the mines only a few months. In these some of the epithelial cells lining the alveolæ can be seen to be swollen and to contain coal-dust. Sometimes a few larger desquamated cells containing much pigment can be found in the alveolæ, lying loose with some detritus and free dust particles. Even in the early stage dust particles can be seen in the walls of the air vesicles and around the bronchi. In this stage there is no thickening.

The second stage occurs in those who have worked in the mines for several years. In these cases the swollen epithelial cells containing dust particles are much more numerous. The alveolæ contain more detritus consisting of swollen, dust-bearing, epithelial cells, and free dust, and some leukocytes. The pigment in the walls of the air vesicles is more marked. It collects particularly in the connective-tissue septa between lobules, where it is in such large masses as to be easily seen by the naked eye in microscopic sections. These are especially well seen in the septa that run in from the pleura and one will frequently see considerable-sized black triangles with their bases on the pleura showing where some septum has been completely filled up with dust. With this deposit there goes an increase in the connective tissue of the alveolar septa wherever there is much dust. The interlobular septa thicken as does also the peribronchial connective tissue, as here also the dust tends especially to collect. With this stage the bronchial and mediastinal

lymph glands are enlarged and perfectly black. The glands in the lesser omentum are also frequently black from dust swallowed in the saliva. This increase of connective tissue is almost never sufficient to give signs of consolidation. With this stage sometimes comes the condition misnamed "miner's asthma." This is really a chronic bronchitis and emphysema both in symptoms and physical signs.

A third interesting picture is seen in those who have formely been miners for many years but who have not been in the mines for some years before death. In these the signs of irritated swollen epithelium have subsided. The epithelium is again normal and neither the cells nor the alveolæ contain dust. The deposits of dust in the alveolar walls, the septa and the peribronchial tissue still remain and there is the same connective-tissue thickening.

This histological picture of epithelial irritation and connective-tissue thickening with consequent loss of elasticity of the air vesicles easily accounts for the condition inaccurately termed "miner's asthma." This is clinically a chronic bronchitis and emphysema. We had formerly considered that the simple anthracosis could never give rise to physical signs of consolidation. Quite recently, however, we have seen an old miner who had distinct signs of consolidation down to the fourth rib on the right side. There had been no history of acute inflammation nor of tuberculosis. Repeated sputum examinations and the tuberculin test were negative and we were forced to conclude that the signs of consolidation were due to anthracosis. In some fifteen autopsies on miners we have never seen any diffuse consolidation. Only once have we made out tuberculous scars at the apices. Though these can easily be concealed in the blackened lung.

"Miner's phthisis," which is an unfortunate term used in England, is undoubtedly a misnomer as far as the phthisis goes. Real tuberculous lesions in miners are always due to the tubercle bacillus.

It may be of interest to note in passing merely as a matter of record that we have made a number of analyses of miners' lungs and those of people who are not anthracotic. By the most careful methods we could employ we found that there was a considerable margin of error. In a rough way we can say that the foreign matter in the lungs of old miners is about 33 per cent. of the dried lung. In adults who have not been especially subject to dust it runs from 1 to 3 per cent. or a little over.

The quantitative estimation of the dust in mines may also be of interest. This quantity naturally varies with many conditions. The average of twenty-five different determinations of the dust in mines which we have taken is 0.0354 gram per cubic metre. The screen-rooms in the breakers were much more dusty, giving an average of 0.3967 gram per cubic metre.

The only other quantitative determination of the amount of

coal-dust in mines which we have seen in literature is that of Hesse, quoted by Dirksen,[10] as 0.0143 gram per cubic metre of air.

A comparison of the quantity of dust in the air in mines with that in other places can be seen in the following table complied by Dirksen:

TABLE VI.—AMOUNTS OF AIR IN VARIOUS PLACES.

	Observer.	Grams per cubic metre.
City after rain	Tissandier	0.00025
Iron foundry	Arens	0.0015–0.0280
Iron foundry	Hesse	0.0717
Saw mill	Arens	0.0150–0.170
Snuff factory	Arens	0.0160–0.0720
Grinding mill	Arens	0.028
Grinding mill	Hesse	0.047
Cement factory	Arens	0.13–0.224
Felt slipper factory	Arens	0.175
Bunker on steamship	Dirksen	0.0828–2.2897
Coal-mine	Hesse	0.0143
Coal-mine (average)	Wainright and Nichols	0.0354
Coal-breakers (average)	Wainright and Nichols	0.396

From this table it will be seen that there are a number of places as dusty as modern coal-mines. There are few places dustier than the screen-rooms of breakers.

In concluding, we wish to thank Professor Mendel, of Yale, and Professor Abbott, of the University of Pennsylvania, and Dr. Sweet, of the Rockefeller Institute, for many valuable suggestions. And the latter also for placing at our disposal facilities of the Hygiene Laboratory, where a part of our experimental work was carried on, the other portion being done in the laboratory of the Moses Taylor Hospital at Scranton.

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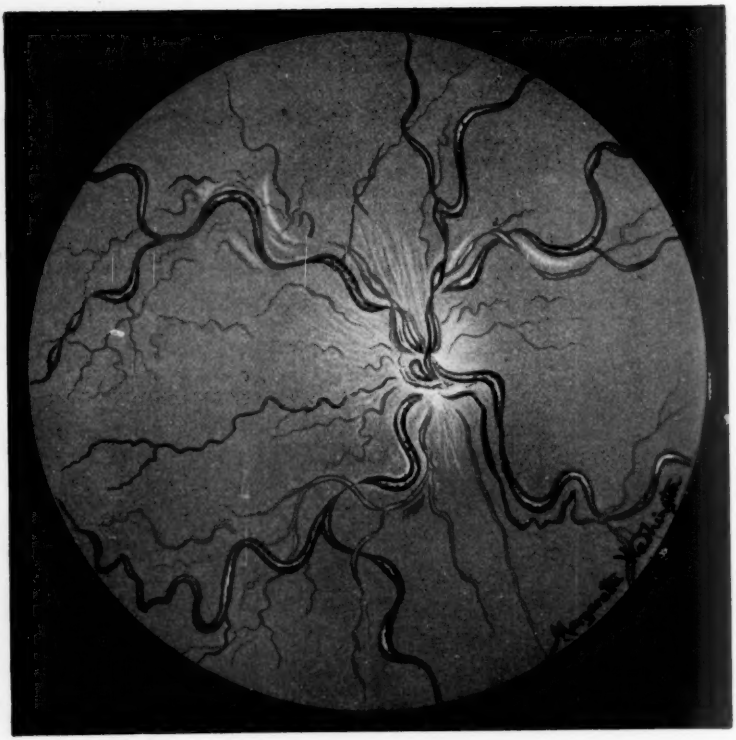

Cyanosis Retinæ.

CYANOSIS RETINÆ.[1]

By William Campbell Posey, M.D.,
of Philadelphia.

This term is used to describe the changes in the fundus which are observed in congenital heart disease with general cyanosis, and was first employed by Liebreich, in 1863, in his report of a case of this kind, the illustration of which may be found in the first edition of his *Atlas*. The honor of being the first to call attention to the changes in the eye-grounds, designated by the term of "cyanosis retinæ," however, belongs to Knapp, who exhibited a water-color and described the ophthalmoscopic findings in such a case before the Heidelberg Society in 1861. Von Ammon[2] had given a short description and sketch of the exterior of the eye in congenital heart disease in 1841, but no study of the fundus had been made, as the ophthalmoscope had not yet been discovered.

Since the publication of Knapp's description other cases have been recorded, although their number is exceedingly small, in view of the comparative frequency of congenital disease of the heart. This is to be accounted for, in all probability, not by the rarity with which this form of heart disease causes changes in the retina, but rather by the failure of clinicians to examine the eye-grounds in these cases, or, in the event of such examinations being made, to allot any special significance to them.

As may be seen by the illustration, from a case recently observed by the writer, and the description of which will follow, the changes revealed by the ophthalmoscope in cyanosis retinæ are most striking, the vessels of the retina attaining a size which is rarely equalled in any other condition, this being particularly true of the veins, which may become enormously dilated and tortuous; the arteries, though usually similarly distended, being affected to a less degree. In addition to the change in their calibre, both veins and arteries become much darker than normal, the former assuming a deep-violet color, while the arteries resemble normal veins. The peripheral twigs of the retinal vessels are distended, and vessels which are usually invisible may be seen over the entire fundus. Pulsation in the vessels is absent. Small hemorrhages are of frequent occurrence in the neighborhood of the disk; more rarely larger ones are found in the macula, when vision may be much affected.

[1] Read before the American Ophthalmological Society, May, 1905.

[2] Clinical Representation of the Diseases and Malformations of the Human Eye (Tafel, vol. xv. Fig. 3, Text, Bd. iii. p. 75.

As is well depicted in von Ammon's sketch, the exterior of such eyes also present marked signs of cyanosis, the lids becoming blue, the sclera violaceous, while the vessels of the conjunctiva are much distended. In the later editions of his *Atlas*, Liebreich withdrew the illustration of the case of cyanosis retinæ which had appeared in the first edition, and substituted for it one of abnormal pigmentation of the eye, to which he inappropriately applied the former name. Although, owing to the popularity of the *Atlas*, this change occasioned for a time some confusion regarding the precise application of the term, the subject is now well understood, and, as indicated in the opening sentence of this paper, the name of cyanosis retinæ is applied to the eye changes observed in cases of congenital heart disease alone.

The congenital diseases and malformations of the heart which may occasion changes in the fundi are various. Thus, they may be found where there is an abnormal connection between the right and left ventricles, and in cases in which there is a stenosis of the pulmonary artery or an abnormal origin of the aorta and pulmonary artery. They may also arise when there is a general retardation of the blood current, as a consequence of congenital dilatation of the entire vascular system.

The cause of the dilatation of the retinal vessels has been a matter of some dispute among clinicians, some maintaining that it is simply the result of the general venous stasis, while others aver that this cannot be true, as retinal changes rarely, if ever, occur in cases of general cyanosis due to causes other than congenital heart disease, and contend, moreover, that the arteries often manifest changes as well as the veins. Most authors attribute the dilatation of the vessels to a stretching in the walls of the vessels themselves, and consider this to be dependent upon a lessened resistance in the walls, due to disturbances in nutrition occasioned by insufficient oxygenation of the blood.

Although the examination of the eye-grounds in cases of congenital heart disease has not been considered by clinicians to be of particular moment, the dilatation and tortuosity of the retinal vessels being regarded as merely additional evidence of the general cyanosis, recent observations by Babinski and Nagel indicate that the ophthalmoscope may be of decided value both in the diagnosis and prophylaxis of this class of heart cases. Thus, Babinski has reported a case in which a marked dilatation of the retinal vessels preceded other evidence of general cyanosis, while Nagel, from a study of the cases in the literature, and from his own observation, asserts that if the ophthalmoscopic examination reveals that the retinal arteries as well as the veins are darker and broader than normal, the presence of a connection between the two sides of the heart is assured; when the darker coloration and tortuosity is limited to the veins, he believes that the existence of some other

congenital lesion is indicated, which does not permit the admixture of venous with arterial blood.

If these observations are true, clinicians should be made fully cognizant of them, for it is generally conceded that the diagnosis in cases of congenital heart disease is at times practically impossible from a study of the physical signs. It is hoped, therefore, that the practice of examining the eye-grounds in this class of cases may become more universal, and that the results of such examination be recorded, as it is only by means of a series of such observations that the assertions of Babinski and Nagel can be confirmed, and the actual value of the ophthalmoscope to the clinician proven.

The vision in eyes the seat of cyanosis retinæ may be normal, but if hemorrhages occur, as is not infrequently the case, vision may be more or less involved. Both eyes are usually similarly affected.

The attention of this Society was first called to the subject of cyanosis retinæ by Knapp, in 1870, who exhibited before the annual meeting of that year the sketch which he had prepared of the case exhibited by him in Heidelberg, and gave a short *résumé* of his notes. Since that time no further mention of the condition has been made before the Society, so that the writer considered that a brief *résumé* of the cases which had already been reported, and the details of two additional cases, might be not without interest.

1. As already recorded in the *Transactions* of the Society, in Knapp's case there was non-inflammatory, excessive hyperæmia of both retinæ, occurring in a patient with enlargement of the heart, but without valvular anomalies, who exhibited general cyanosis and aneurysmal bruit at different parts of the body. The retinæ were so vascular that a countless number of thick and tortuous arteries and veins arose from the optic disks and branched radiating toward the periphery, like a caput Medusæ. The area and borders of the optic disks were totally concealed. The yellow spot was distinctly discernible. A great number of arterial and venous twigs reached to the fovea centralis. The retina, refracting media, sight, and visual field of both eyes were perfectly normal. The patient died in the hospital at Heidelberg. The body was found to exhibit a general enlargement of the whole vascular system.

2. The next case was observed by Liebreich, in 1863, and, as already stated, was illustrated in the first edition of his *Atlas*. Examination of the vascular system showed stenosis of the pulmonary artery, with considerable hypertrophy of the right ventricle. There was general cyanosis. The ophthalmoscope showed the retinal veins to be twice as broad as normal, without being tortuous or presenting unevenness. The arteries were normal.

3. Leber[1] reported the third case, calling particular attention

[1] First edition of the Graefe-Saemisch Handbuch, Bd. v. p. 525.

to the color of the blood, which was unusually dark in the arteries, being about the same color that the veins normally present, while in the veins it was dark violet-brown. The vessels were full and stood out from the level of the eye-ground. The anterior ciliary veins were unusually dark and the conjunctiva cyanotic. The patient was the subject of general cyanosis, and was thought to have stenosis of the pulmonary artery. This author, in his capacity as assistant, had had an opportunity of studying Knapp's case, and referred to it at length in his treatise in the first edition of the Graefe-Saemisch *Handbuch*.

4. In 1878 Stangloneier[1] reported a case of pulmonary stenosis in which there was endocarditis of the pulmonary valves, a patulous foramen ovale and ductus Botalli, small retinal arteries and very tortuous veins, with two large hemorrhages in the nasal part of the retina, which appeared shortly before death.

5. In the next case, a man aged twenty-five years, reported by Litten[2] in 1882, the fundus was found to be abnormally dark, emitting a decidedly bluish reflex. The retinal veins also were enlarged and tortuous. Examination showed a complicated valvular defect in the ostium pulmonale, associated with a defect in the interventricular septum. The same author[3] referred to another kind of cyanosis retinæ, namely, that produced by aniline poisoning, and cited a case in which the conjunctiva and fundus appeared violet and the retinal bloodvessels almost black. Vision was unaffected.

6. Nagel reported the sixth case, occurring in a boy aged nine years. One eye was staphylomatous, following a perforating ulcer of the cornea three years previously. The fundus of the fellow-eye showed the typical changes of cyanosis retinæ, the entire eye-ground being dark red and the veins almost black. The author was of the opinion that the marked cyanosis, the dyspnœa, the coolness of the skin, the clubbing of the fingers, pointed to a stenosis of the pulmonary artery, with probable mitral insufficiency.

7. In his monograph on *Congenital Affections of the Heart* (p. 23) George Carpenter cited a case which occurred in a child five and a half years old. There was extreme general cyanosis, the face and body being dusky, the mucous membrane slate-colored and the conjunctiva suffused. Ophthalmoscopic examination "showed the retinal veins to be *very* large, the arteries of good size, and both sets of vessels most intensely cork-screwy. There was no edge to the optic disk, and the red reflex apparently started from the physiological pit." At the autopsy both ventricles were hypertrophied and dilated, the right being in excess. The right auricle was twice

[1] Inaug. Dissert., Würzburg, 1878; Nagel's Jahrbuch f. Ophth., 1878, p. 261.
[2] Deutsche med. Wochen., 1887, No. 8, p. 144.
[3] Berl. med. Wochen., 1881, Nos. 1 and 2.

the thickness of the left, but the left was dilated and the right auricular appendix was four times the size of its fellow, which was decidedly small. There was a patent septum ventriculorum, capable of admitting the index finger. The foramen ovale was closed. The aorta arose equally from both ventricles, and there were further abnormalities in its branches.

8. The same author referred to a second case, seen by him, in a small boy who was somewhat cyanosed. No cardiac bruit was detected. An ophthalmological examination revealed fundal changes similar to those noted in the case just reported, and suggested to him the nature of the complaint.

At the close of his interesting monograph Carpenter gave the notes of 22 cases of congenital heart disease, but unfortunately an ophthalmological examination appears to have been made in but one instance, where the history contains the note that "the veins of the optic disk pulsate and appear beaded."

9. In Loring's *Text-book of Ophthalmology* (vol ii. p. 106) will be found the notes of an additional case, occurring in a young woman aged twenty-eight years. Loring reports: "She had never noticed that her skin was darker than that of other people until six years ago, when she was shipwrecked, during which she was much terrified. Her finger-nails were, however, club-shaped, and she had been informed by her mother that this had been the case since she was ten months old. Her skin is now of a livid, bluish tinge, with dark-purple spots upon the face and hands, and she thinks that the color is increasing in darkness. The ears are purplish and the conjunctiva a good deal injected.

The veins of the fundus are enormously enlarged and tortuous, and have an anteroposterior curve in certain places, but only on the disk and its immediate neighborhood. There are very many vessels that are plainly visible and can be traced far into the retina, which, in the normal state, are either not present or are so minute as to be invisible. The color of the blood in the veins is of a violet tinge. The arteries are considerably enlarged, but not so much as the veins. The blood in the arteries is of the color of ordinary venous blood. There is no pulsation in either arteries or veins. An exhaustive examination by an expert failed to bring to light any disease of the heart or any abnormality in its sounds. The ophthalmoscopic picture presented a strong similarity to that of choked disk, and had been, indeed, taken for that."

10 and 11. In 1892 Hirschberg observed two cases. In the first the retinal veins were dark blue, tortuous, and dilated. There were, in addition, general cyanosis, fingers clubbed, pulmonary emphysema, dilatation of right heart, and vision reduced to one-quarter in each eye. In the second case the heart was malformed and there was the same appearance of the eye as in the preceding case. Vision was normal.

12. Another case was reported by Galezowski,[1] in which vision was said to have been much lowered by intense congestion of the retina in the macular region, and, as in Stangloneier's case, retinal hemorrhages appeared a few days before death.

13. In 1899 Fehr reported a case before the Berliner Ophthalmologische Gesellschaft, April 20, 1899, but the writer has not had access to the *Transactions* of the Society, and has been unable to find the notes of the case elsewhere.

14. Quite recently Goldzieher[2] reported an interesting case of congenital disease of the heart with hyperglobulia, in which the left eye was lost, as a consequence of hemorrhagic iridocyclitis, and the right eye presented the typical changes described as cyanosis retinæ. The patient was a female aged nine years, who had always been sickly and had suffered repeatedly from nasal hemorrhages. The exterior of both eyes presented marked signs of cyanosis. The retinal arteries and veins of the right eye were much enlarged and darkened, and the edges of the disk were everywhere sharply outlined; there were no hemorrhages. The iris of the left eye, however, was stippled with small hemorrhages, and the vitreous contained so much blood that no reflex could be obtained from it. The globe was stony hard, and finally underwent spontaneous rupture through the sclera at the equator. Dr. Hochwall, who made a careful study of the case clinically, found a considerable increase in the hæmoglobin in the blood, as a consequence of increase in the number of red blood corpuscles, which he considered to be an expression of increased concentration of the blood. He thought the hyperglobulia was dependent upon the disturbance in the circulation, as a consequence of the congenital affection of the heart, and was not an instance of the symptom-complex in which there is an association of polycythæmia, cyanosis, and tumor of the spleen. The determination of the precise nature of the cardiac lesion was difficult, but the physical signs and the employment of the *x*-rays indicated that either the foramen ovale was patulous or that there was a defect in the septum atrium.

15. In 1904 Babinski[3] saw a case in a ten-year-old subject with stenosis of the pulmonary artery. General cyanosis first appeared at three years of age, during an attack of whooping-cough. Left-sided hemiplegia developed at this time also. The retinal arteries were tortuous and dilated, and the veins were enormously enlarged.

16. In a recent number of the *Annales d'Oculistique*, February, 1905, the same author, in conjunction with Toufesco, reported another case occurring in a male aged thirty-five years. The patient had been sickly, but symptoms of cardiac congestion first became manifest after a prolonged attack of typhoid fever, when

[1] No reference. Cited by Babinski, Revue neurologie, 1904, vol. xii. p. 1146.
[2] Centralblatt f. prak. Augenheilk., September, 1904.
[3] Revue neurologie, 1904, vol. xii. p. 1143.

seventeen years of age. The pulmonary artery was stenosed. *Cyanosis of the retina was found without general cyanosis, both arteries and veins being markedly dilated.* The authors conclude from this that general cyanosis as a consequence of stenosis of the pulmonary artery may manifest itself in the retina before changes appear in the skin.

17. In 1903 a case of cyanosis retinæ was observed by the writer, which had been referred to him at his service in the Howard Hospital by Dr. S. M. Hamill, who had made a careful study of the general condition of the patient, which he later embodied in a report which has been published elsewhere.[1] The abbreviated history was as follows: The patient, a boy aged nine years, first became blue when a few months old. Dyspnœa had always been marked upon exertion. At the time of examination the boy was noted as being of normal size for his age and well nourished. The skin of his face and body and all the visible mucous membranes had a deep, purplish color. The skin was rough and dry and was covered with small, bluish follicles. The hands and feet were especially congested, and clubbing of both fingers and toes was present to a marked degree. Examination of the heart showed a double impulse, which was most marked in the fourth interspace. The left chest was more prominent than the right, but there was no thrill. At the apex there was a rather soft, short, blowing, early systolic murmur, which accompanied the first part of a divided first sound. The murmur and the divided sound were both heard in the axilla, over the body of the heart, and best in the third space to the left of the sternum. The murmur was heard faintly in the aortic area. The second pulmonic sound was much accentuated. The heart's action was fairly regular and rapid. There were marked pulsations in the veins of the neck and in the subclavians. Posterior to the sternocleidomastoid muscle of the left side, and almost directly underneath the mastoid process, there was a marked pulsation, which on palpation felt like a tortuous and anomalously located external carotid artery. Dr. Hamill was unable, from the physical examination, to reach any satisfactory conclusion regarding its specific character, but inclined to the view that the case was one of stenosis of the pulmonary artery, with patulous ductus arteriosus, basing this opinion upon the age of the patient, the location of the murmur, and the greater frequency of this form of cardiac lesion.

As incorporated in Dr. Hamill's report, the condition of the eyes was as follows: The eyeballs were prominent. The conjunctival vessels, both those of the globe and those of the lids, were swollen, especially the veins, giving the eye a violaceous appearance. The pupils were large and the media clear. Vision was 5/6 in each eye.

[1] Pediatrics, May, 1903.

The ophthalmoscope showed a neuroretinitis of marked degree. The retinal arteries and veins were greatly swollen and tortuous, resembling large angle-worms. The writer does not remember ever to have seen retinal vessels of a larger calibre, the retinal veins appearing to be increased to three times their normal size. The head of the optic nerve was obscured by the swollen retina, and there were a few small hemorrhages into the nerve-fibre layer of the retina close to the disk.

18. About the same time that Dr. Hamill's case was under observation, Dr. W. C. Swindells, the office assistant of the writer, found similar changes in the eye-grounds in a case of Dr. Howard Fussell, to whom he is indebted for the following notes: "Male child, aged one year; presented no abnormality during the first two weeks of life. When next seen by Dr. Fussell, however, about a year later, marked signs of cardiac disease had manifested themselves. It was elicited from the mother that when the child was about two or three months old, and while he was lying in the cradle, he was suddenly seized by an attack of unconsciousness, during which his entire body became blue. As he grew older and moved about, attacks of dyspnœa became frequent, during which the face and fingers became blue. Occasionally, and especially when he was disturbed or attempted to run, attacks of unconsciousness supervened, during which the finger-nails became blue and the lips cyanosed. Examination revealed that the fingers were clubbed; the precordia was prominent, and there was a marked prominence over the junction of the first and second piece of the sternum. The heart dulness was at the right border of the sternum and first rib diagonally downward to the nipple line. There was a very rough systolic murmur heard all over the chest, with greatest intensity at the upper border of the heart dulness, and transmitted into the vessels of the neck.

Shortly after this, and while still under Dr. Fussell's observation, the child had an attack of what was considered to be pneumonia and later was ill with true diphtheria with laryngeal stenosis. During the treatment of the diphtheria 2000 units of antitoxin were administered, with no untoward effects. After convalescence it was noted that the heart dulness had moved still farther to the right and was broader at the apex. A month later the cyanosis was more marked and the dyspnœa had become constant. The heart's action was slow and regular. A loud, high-pitched systolic murmur was heard over the aortic cartilage. The second heart sound was accentuated. To the left of the sternum the murmur was not as loud nor the second sound as sharp. The murmur was heard, however, over all the anterior part of the chest, its point of greatest intensity being just over the sternum, below the junction of the first and second parts. It could be faintly heard in the vessels of the neck and in the back. There was no pulsation in the

external jugular. The second sound was loudest midway between the nipple and sternum, over the fourth interspace. The edge of the liver could not be plainly felt, but there was more resistance on the right side than on the left. The upper line of the liver dulness corresponded to the fifth rib in the axilla. There was no œdema of the legs. The child grew gradually worse and died a few months later with symptoms of cardiac failure. No autopsy was permitted; so that the probable diagnosis of mitral regurgitation, with, perhaps, some communication between the two sides of the heart, could not be ratified.

Owing to the fact that the diagnosis of the cardiac condition in the 18 cases which have been just cited was confirmed by autopsy in but four instances, and that the descriptions of the changes in the eye-grounds in most cases are too meagre from which to draw inferences regarding the precise lesion in the fundus which the various cardiac lesions may occasion, it has not seemed worth while to attempt to summarize the facts which have been given, or to seek to prove the truth of Nagel's assertion from them. As indicating the value of ophthalmoscopic examination in cardiac cases of this type, it is of interest, however, in addition to the case of Babinski, which has already been cited, to refer to Carpenter's second case in which there was no cardiac bruit and but slight cyanosis, and the true nature of the complaint was determined only after the discovery of the typical changes of cyanosis retinæ by the ophthalmoscope.

SCARLATINAL OTITIS.

By Frank B. Sprague, M.D.,
SURGEON TO THE EAR, NOSE, AND THROAT HOSPITAL, PROVIDENCE, RHODE ISLAND.

Strange as it may seem in these days of advanced thought in medical science, there are yet a few physicians who are firmly adherent to the old notions of tentative medicine.

After all that experience has taught as to the dangers to the functions of hearing and of life itself by ear inflammation complicating scarlet fever, yet there are many of our profession who assume an attitude of expectancy and contented helplessness, and a peculiar sense of satisfaction when an ear aches, breaks, and runs during the course of this infectious disease.

This is unfortunate for the science of medicine and for the human race, and inexcusable in these days of enlightenment.

We might excuse the doctor of past generations, who felt that scarlet fever must leave some "corruption" in the system and felt

that the organ of hearing could be spared better than the kidneys or other organs, so he welcomed with delight the appearance of pus in the auditory canal, feeling that now the system was safe from harm.

Otitis media is the most frequent complication of scarlet fever, and, everything considered, the most serious. Like the general infection, its severity varies with the epidemic, the climate, and the seasons of the year. It is more common in the winter and spring months and in the colder climates. Statistics show that from 3 to 9 per cent. of the cases of scarlet fever have ear complications, and in about 50 per cent. of these cases both ears are affected. Bezold, of Munich, collected 640 cases of aural disease secondary to scarlet fever covering a period of eleven years in which 984 organs of hearing were affected, about one-half of them being bilateral. During the same time he estimated, from other statistical sources showing 17,087 cases, that 3.75 per cent. of all cases had ear complications. In 530 of Bezold's cases 263 had a continued discharge from the ear lasting over eight years; and a total destruction of the drumhead in 25 per cent. of these cases. In another report of 185 cases he shows that in 30 there was an entire destruction of the drumhead with the loss of one or more of the ossicles; in 59 the perforation in the drumhead comprised two-thirds or more of the membrane; in 13 there were small perforations; in 44 granulations and polypi; in 15 total loss of hearing on one side, and in 6 cases total loss on both sides; in 77 cases the hearing distance for whispered voice was less than half a metre.

Of 4397 cases reported by Finlayson, otitis occurred in 10 per cent., and of 1008 by Caiger, 13 per cent.; in Burkhardt-Merian, 33 per cent. The greatest importance is attached to the inflammation of the middle ear, although the affection of the labyrinth or otitis interna are of no little moment, when one considers the large number of cases of total deafness, and the large percentage of inmates of deaf-mute institutions where otitis is due to scarlet fever.

Dr. Blau found from statistics of eight authors 14,045 cases of otitis interna with 55 cases, or 3.8 per cent., due to scarlet fever. Bruckner gives 7 per cent.

In a survey of the deaf-mute asylums of Europe, in 1887, the smallest percentage was found in Italy, 1.5 per cent., and the largest in Norway, 27 per cent., representing the ratio of the cases due to scarlet fever and showing the relative frequency of the disease in the warm and cold climates.

May has collected statistics in New York of 5613 deaf-mutes, 572 of whom, or nearly 10 per cent., owed their condition to otitis of scarlet fever. Holmes, of Cincinnati, reports that in the deaf-mute institute in Jacksonville, Ill., of 500 cases 7.2 per cent. were due to this disease. In the Rhode Island School for the Deaf out of 201 cases admitted 44, or 21.3 per cent., were due to scarlet fever.

In the Clarke School of Northampton, Mass., 105 out of 640, or 16.4 per cent., were due to scarlet fever.

On the other hand, statistics at large show that of all cases of suppurative otitis media about 12 per cent. are due to scarlet fever, thereby showing that a disease which impairs and often destroys the function of one of the most important organs of special sense, which is the focal point of infection in many cases of septicæmia, pyæmia, meningitis, brain abscess, and is a constant menace to the patient's life, is a complication of scarlet fever which is often ignored or even welcomed by the physician with content.

For illustration in the study of this disease I wish to use a season's experience in the scarlet-fever wards of the Rhode Island Hospital. Beginning about the middle of January, 1904, and continuing till the middle of June, I had the privilege of watching some 60 cases. The ears and throats of each case were systematically examined at regular intervals. During these five months 7 cases of suppurative otitis media developed, and 3 cases were in active progress when the patients were admitted, making 10 cases in all, or about 17 per cent. Seven cases were bilateral and 3 unilateral. Of the 7 which developed after admission, 4 were characterized by pain in the ear and rise of temperature and increased rapidity of the pulse. Three of the 7 had no pain whatever, the only condition which attracted attention being a sudden rise in temperature which could not be otherwise accounted for. These cases were discovered by examination of the ear, in accordance with a standing order that in the event of a sudden rise of temperature or increase of fever symptoms in any of the cases, I was to be notified immediately, it being my purpose to forestall the ulcerative spontaneous perforation of the drumhead by a good, free incision, assuring immediate depletion of the parts and adequate drainage. Of the 17 suppurating ears, 2 went on to suppuration and necrosis of the mastoid. These were operated and made an uneventful recovery. One of the cases, a girl of ten years, who had a very severe general infection, streptococcic pharyngitis and nephritis, the ear is still discharging a little at intervals.

In 4 other cases, in which paracentesis was done, the drumheads healed perfectly and hearing returned to normal condition in a very few weeks. In one of the severe cases, which had nephritis but no severe pharyngitis, the drumheads of both ears and two of the ossicles (malleus and incus) of the left ear were swept out as clean as if eaten out by acid, in spite of the most careful and energetic treatment. In this case the ears were still discharging when seen ten months later. The other 3 cases were lost track of after discharge from the hospital.

The bacteriological study of these cases was intensely interesting. The cases were very carefully followed in the laboratory by Drs. Fulton, McElroy, and Barrows.

Four cases on which paracentesis was performed showed streptococcus in pure culture in the discharge which was taken from the canal immediately after the incision was made—these were the cases which healed the most rapidly—the ear returning to its normal condition in a few weeks. All of these cases, however, showed a mixed infection within a week after the first culture. An examination showed staphylococci and other organisms with the streptococci in each case. One of these also had a diphtheria-like bacillus in combination with the others. It is interesting to note that this case healed the quickest of any case in the series, and it is also interesting to note that the case which had so extensive destruction of tissue and ossicles had exactly the same combination of organisms.

The diphtheria-like bacillus which was found in 3 cases differs from the Klebs-Loeffler bacillus, so this was not considered a diphtheria infection. I might add that while we had a few cases of the double infection, diphtheria with the Klebs-Loeffler bacillus and scarlet fever, yet in these cases under consideration the Klebs-Loeffler bacillus was not found. As yet no specific organism has been isolated as being peculiar to the otitis of scarlet fever; and bacteriology has not yet given us any specific organism for this very common infectious disease. Leutert,[1] a former assistant at Schwartze's clinic, who has done considerable research in this line, is of the opinion that the malignant forms of scarlatinal otitis characterized by rapid destruction of tissue are due to streptococcus, and he likewise thinks that streptococcus is the germ that gives to scarlet fever the picture of a severe disease, while the so-called specific germ of scarlet fever seems to have no relation to the general infection and suppuration. Kurth frequently found a kind of streptococcus laid together in chains forming a lump-like colony which he called streptococcus conglomeratus.

Before bacteriology revealed to us the possibilities of the infection in scarlatinal otitis it was always considered as diphtheritic, and nearly all authors up to the present time classify this form of otitis as diphtheritic or scarlatinal-diphtheritic; and the natural inference is that it is necessary to have a diphtheritic infection of the throat in order to have the otitis. In our cases there was no diphtheria infection in either throat or ear.

Clinically there are three forms of scarlatinal otitis which I prefer to classify as follows: 1. Acute serous. 2. Acute suppurative. 3. Acute necrotic. The severity of the otitis seems to be dependent on the severity of the general infection on the one hand, and the constitution of the patient on the other. Anatomical conditions and the structure and condition of the vasomotor system are important factors. In children previously healthy and with

[1] Archiv. f. Ohrenheilkunde, Bd. xlvi. and xlvii.

good firm skin, normal lymphatic system, and good resistance generally, the disease assumes the milder form if the general infection is not too severe. In children of the lymphatic diathesis, so-called scrofulous tendencies, subject to swelling of the glands of the neck, enlarged tonsils, and hyperplasia of the adenoid tissue of the pharynx, we see the severe forms of the disease.

Acute Serous Inflammation. The mild forms of otitis occur mostly about the time of the eruption or within the first ten days, or while the prodromal pharyngitis is active. The symptoms are similar to those of ordinary acute catarrhal otitis media. If the patient is old enough he complains of a feeling of fulness in the ear, pulsating noises, slight deafness, and varying degrees of pain, some slight, some severe, and in some there is no complaint of pain at all. In the young children we are only led to think of the ear by an increase of fever symptoms and evidence of discomfort by restlessness and crying; and perhaps by the discovery of a discharge from the ear.

Examination of the ear with the head mirror and speculum under a strong light reveals, in some cases, a slight redness and swelling of the fleshy portion of the canal, according to the period of the scarlet fever and the condition of the skin of the body. If desquamation has begun, the canal is usually coated with scales of epidermis, and the wax glands seem to have an increased activity at this time while the opening of the canal is usually well coated with wax. The drumhead varies from a dull, flat appearance to that of intense congestion and bulging. After three or four days of the subjective symptoms, a discharge of serum is noticed escaping from the canal, the pain subsides, the fever symptoms diminish, and if the ear receives no secondary infection it heals after a few days. Unless these cases are under close observation, as in a hospital or by a trained nurse, they are rarely seen until the drumhead has ruptured. Probably most of these simple cases become secondarily infected and continue on into the purulent form. When this is the case the discharge of serum takes on a purulent character and becomes more profuse, the patient becomes restless and more feverish, with a general increase of toxic symptoms, and suffers more or less pain deep in the ear and mastoid bone.

Acute Suppurative Inflammation. This form of otitis usually occurs somewhat later in the course of the scarlet fever than the previous form, about the second week, although it is probably dependent upon the severity of the general infection. The subjective symptoms are much more severe; the sudden increase of feverish symptoms is very pronounced, the temperature often rising to 103° or more. The pain in the ear is lancinating and throbbing in character, radiating from the depths of the ear to different parts of the head and neck. Swelling of the glands of the neck with stiffness of the muscles and torticollis are fre-

quently present in these cases. In some there is evidence of cerebral irritation shown by convulsions and vomiting, so that meningitis may be feared. We must bear in mind, however, that these cerebral symptoms are often among those which usher in the general infection, but when they occur after eruption is complete, or later, they may accompany kidney or ear complication.

Objective Symptoms. In cases where the drumhead has not ruptured, the canal is scaly and at its entrance abnormally coated with wax, and is often swollen. The drumhead is œdematous, swollen, varying in color from a bright to a dusky red, and bulging in parts or as a whole, to a greater or less degree, sometimes protruding a fourth of an inch or more into the canal. Even after spontaneous perforation has taken place this enormous protrusion of the membranes of the drum cavity is sometimes seen.

Acute Necrotic Inflammation. This malignant form of otitis is commonly called the diphtheritic form. This type of the disease is analogous to the throat condition known as scarlatinal diphtheria, although Klebs-Loeffler bacillus are not found in the discharges, nor are there any of the paretic sequelæ so common to diphtheria.

The term diphtheritic which infests the traditional teaching of disease of the throat and ear makes it very difficult to estimate the true conditions which have existed in the history of these membranous and exudative forms of disease of these organs; but bacteriology has done much, and we hope soon will do more, toward clarifying this befogged condition. Many cases of the so-called scarlatinal diphtheria, characterized by severe infiltration of the lymphoid tissue of the throat and membranous deposits on the tonsils and posterior and lateral walls of the pharynx and of the mucous membrane surface of the nose, show pure cultures of streptococci or staphylococci, or the mixture of the two, Klebs-Loeffler bacilli being absent.

This malignant or membranous form of otitis is to be considered the most severe form of ear disease, the infection being intensely virulent, and the destruction of tissue very rapid, often sweeping out the entire drumhead and the ossicles in a few days. If it is uninterrupted by treatment, the necrotic process destroys the inner membranes of the tympanum, those of the round and oval windows, invades the labyrinth, destroying the membranous labyrinth and organ of Corti, thus destroying the organ of hearing and disturbing the equilibration of the body causing a rolling, staggering, or tottering gait for a long time after recovery. Cases have been reported, and I have seen two, where parts of the labyrinth and cochlea were exfoliated in the necrotic process and removed as a sequestrum at operation.

In other cases the infection travels on through the internal auditory canal, damaging both the auditory and facial nerve, the latter

causing facial paralysis, and on into the meninges of the brain causing meningitis and death. Post-mortem examinations in these cases have revealed necrosis of the cochlea and deposits of membranous and necrotic tissue in the vestibule and other parts of the labryinth.

The appearance of this type of otitis, as seen through the speculum at the early stage of the inflammation, is similar to the violent suppurative form, but the drum membrane soon becomes livid, or has a yellowish-white pulpy look having the appearance of a false membrane which doubtless is present, similar to the false membrane of the pharynx, and contains quantities of streptococci. The secretion at first is not abundant, in fact very little, but in a few hours a brownish, purulent fluid with a very fetid odor of tissue necrosis is present. The hearing soon lessens, the drum membrane dissolves away, and the drum cavity is filled with this membranous exudate with a foul odor. When the labyrinth is affected its onset is signalized by sounds like the ringing of bells or the clanging of steel, and by dizziness. In some cases the labyrinth becomes involved primarily.

CAUSE. The cause of scarlatinal otitis is evidently a streptococcus infection, the method of invasion being still a matter of discussion; formerly it was thought that the avenue of invasion was through the Eustachian tube, and some hold this view to-day. More recent investigations suggest that it is hæmatogenous, the infection carriers finding their way to the tympanum through the blood current.

It seems to me that in some of the milder forms infection is carried through the Eustachian tube, and in the severer forms through the blood current or through the lymphatic system of the pharynx and tympanum, or, perhaps, like other cavities with small outlets, the Eustachian tube becoming closed by the pharyngeal inflammation, a vacuum is produced in the tympanum, causing it to fill with serum, and in the presence of infection a suppurating process is established.

PROGNOSIS. Prognosis as regards both the continuity of the organ of hearing and of life is largely dependent on prompt treatment and proper care. The simple forms are favorable, the severe ones not so favorable, especially as regards hearing, for in some a large part of the hearing is lost, and the case goes on to necrosis of tympanum, ossicles, and mastoid, in spite of the most careful treatment. Cases where adenoids in the nasopharynx and enlarged tonsils are present, also children of scrofulous diathesis, are apt to have a severe time of it. And while the outlook, as far as immediate danger to life is concerned, may be good, there is always the loss of the hearing function or its impairment to be feared, and the establishment of a chronic otorrhœa which is a nuisance to the patient and his family and friends, and with all its attending dangers it is a constant menace to life itself.

TREATMENT. Treatment is naturally surgical and antiseptic. We are dealing with an infectious process caused by some one or a number of varieties of micro-organisms, and this simple or mixed infection, as the case may be, must be removed as soon as possible, and the part kept as free as possible from them until healing is complete.

Some recommend preventive treatment by irrigating the nose and throat daily to keep the amount of infection reduced to a minimum. This procedure I think is one attended by great risk, as there is danger of washing infection through the Eustachian tube into the tympanum, and thereby setting up the inflammation one is trying to avoid. The patient should be kept in a warm room night and day, avoiding rapid changes in the temperature, draughts, and chilling of the body after bathing; this will do much toward preventing congestion of the ear and mucous membranes of the body, for the less the circulation in these parts of the body is disturbed the less will be the danger of inflammation. When the lymphatics of the neck show signs of swelling, ice should be applied in a throat or ear ice-bag and kept on constantly. Iodide of lead ointment is also useful in reducing the inflamed glands.

If spontaneous rupture of the drumhead takes place and the ear begins to discharge serum, this should be removed by pledgets of sterilized cotton and *not* by syringing, as any disturbance of this condition as by an unsterile syringe or other instrument might result in a secondary infection. When the discharge has become purulent then it should be syringed every two or three hours, in order to keep the canal as free from pus as possible, and avoid an infection of the deeper parts and the external glands of the ear and lymphatics surrounding it.

When a case of scarlet fever is first seen by the physician, instructions should be given to the parents or nurse regarding the ear complications, and if the patient complains of pain in the ear, or manifests any discomfort in the ear by putting the hand to it or rubbing it, moving the auricle, or refusing to lie on the affected side, or if a sudden rise of temperature occurs, strict orders should be given that the attending physician be notified at once; and he should immediately examine the ears, and if any of the appearances of the drumhead above described should be present, he should at once incise it freely. If the drumhead is to be incised, the canal must first be sterilized by syringing with 1: 2000 bichloride and carefully dried with sterile cotton, and a sterile instrument used. The canal should then be closed by sterilized cotton, and changed as often as it becomes saturated, great care being taken to see that the hands and instruments are clean. If the discharge becomes purulent, the canal should be syringed and any one of the following solutions may be used: Sodium bicarbonate solution 1 drachm to the pint, lime-water, normal salt solution, carbolic acid,

1: 40; saturated solution of boric acid, or 1: 500 permanganate of potassium solution. After cleansing, the canal should be dried with sterile cotton and a solution of boric acid in 60 per cent. alcohol instilled into the canal. In the severe cases a 1 per cent. solution of bichloride of mercury in 60 per cent. of alcohol, or 2 per cent. nitrate of silver solution may be dropped into the ear, these solutions having been previously warmed.

If swelling of the mastoid lymphatics or tenderness over the mastoid region occur, the aural ice-bag should be applied, and if relief is not had within a few hours, leeches should be applied over the tip and upper part of the mastoid bone. These measures will usually give prompt relief and often stay the progress of the inflammation. If the disease goes on to suppuration of the mastoid, operation will be necessary, and should be performed without delay; yet if the indications for operation are not especially urgent, I prefer to wait until after desquamation is complete, as in my experience if the operation is performed during desquamation, or if within six or seven weeks from the onset of the fever, the repair process is extremely slow, even after a week has elapsed following operation, there will be little or no formation of new tissue in the bone cavity. The discharge from the wound is very profuse and intensely acrid, excoriating the parts wherever it touches, ulcerating the fresh cut surfaces and sloughing out the stitches and destroying the new healthy granulation tissue that may have formed. The large open wound resulting from this destructive process affords an unprotected area for septic infection, and with the virulent nature of the discharge, which contains quantities of streptococci and staphylococci, the system is exposed to great danger. One of our cases developed a pronounced septicæmia, unquestionably from this cause.

A word regarding the contagious nature of the discharge would not be amiss. A recent experience at the hospital will furnish a good illustration of the care needed in handling a discharging ear immediately after the scarlet fever has had its run. There were three children representing three families who had fulfilled the demand of the Board of Health regarding quarantine and returned to their respective homes, each child with suppurating ears. Within ten days after their discharge from the hospital one other child from each family was admitted with scarlet fever, and it is believed, after careful investigation, that these new cases were started by coming in contact with the discharge from the ears of the children who had just returned home. I believe that the discharge from a scarlatinal otitis serves as a good infection carrier, and cases should be detained in an intermediate station, and from other children at least two weeks after desquamation is complete; during this period the ears should have thorough antiseptic cleansing. As a safeguard to the community I think it is essential to consider the

discharging ears in the determination of raising quarantine in scarlet fever cases.

In conclusion, let me emphasize the importance of early recognition of the ear complications of scarlet fever; we should not expect and wait for the ear to "break and run," as is so often done, for this is but little short of criminal negligence, but, through prompt treatment by paracentesis of the tympanum as soon as there is the slightest indication of inflammation in the tympanic membrane or exudate in the tympanic cavity, relieve the distressing symptoms and place the patient in the safest possible condition as regards systemic infection and intracranial complications, and do all in our power to preserve the function of one of the most important organs of special sense.

CONCERNING THE CAUSES OF GALLSTONES.[1]

By Edwin Beer, M.D.,
of New York,
acting visiting surgeon, sydenham hospital; assistant visiting surgeon, montefiore home and bellevue hospital, out-patient department, fourth division.

My purpose in presenting this short paper to this Society is twofold. First, I wish to indicate a new method of investigating a very difficult problem, the causation of gallstones, and to show what results this new method of investigation has borne in my hands. Secondly, I want to interest the members of this Society, who are in a position to examine organs derived from a large number of autopsies, in this method of investigating, so that more cases may be brought together and studied, and the correctness of my data be either verified or denied.

Without going into the earlier history of the theories of gallstone production, which would lead us far astray and tend to obscure the points that I wish to emphasize, I would like to unfold to you the development of the present theory of gallstone production. This development is closely bound to the Strassburg school of medicine, to Naunyn and his pupils. The work of this school gave us our present conception of the etiology of gallstones.

Before the publication of these modern views the whole question of gallstone production was unsettled—just as unsettled as the questions of the etiology of pulmonary consumption prior to Koch's discovery. Diathesis, heredity, age, sex, were regularly named as the causes of cholelithiasis, while the actual processes at work were scarcely considered. In the early nineties Naunyn attacked these

[1] Read before the New York Pathological Society, March, 1905. Since reading this paper I have been able to add a new case to my series.

time-worn causes and he applied all his energies to the annihilation of the diathetic theory and to the building up of a new theory based on bacteriological facts. As was perfectly proper and logical, he set to work to determine the origin of the substances found in gallstones. Bile-pigments, cholesterin, and the organic framework had to be studied and investigated. He had to determine whence they came, under what conditions they were produced, and whether they were increased or diminished by changing the conditions of the experiments. In this work, Kausch, Thomas, and Jankau were of the greatest assistance. From the data furnished by these experimenters and investigators, Naunyn concluded that (1) the solids in bile are independent of general body conditions, that cholesterin is a product of the bile passages, and as such is not influenced by any diathetic or non-local conditions; that (2) bacteria enter the bile system, set up an inflammation, catarrhal in type, which blocks the free outflow of bile, and which is accompanied by an increased production of cholesterin, from the inflamed mucous membrane of the gall-bladder, and *pari passu* an exudation of albuminous substances. In this bacterial catarrh all the elements of the gallstones are present and by processes of precipitation and infiltration stones develop absolutely independently of the general body conditions.

When this view was published no convincing experiments were put forth to establish the positive fact that infection of the bile passages actually produced gallstones. That work was reserved for others and a number of years elapsed before this evidence was furnished. Mignot and Mijake succeeded in producing gallstones experimentally in animals by first partially occluding the cystic duct, thus producing incomplete stagnation of the bile, and then introducing bacteria into the gall-bladder and causing an inflammation of this organ. This work gave the firm support that Naunyn's theory had lacked when it was originally published. Since Mignot and Mijake did their work, others have repeated the experiments with varying results, but no one seems to have tried to follow and analyze the genesis of stones in the human body.

It seemed to me that if certain cases could be studied, I would be in a position to trace the development of gallstones in the human body. To obtain the same or similar conditions to those of the experiments of Mignot and Mijake, I would have to get livers in which there was stagnation of bile and infection of the biliary ducts, as the gall-bladder in acute inflammatory conditions rarely comes to the post-mortem room unopened. Patients are either operated and the bladder is emptied or they get over the acute attack and we know not what has occurred in the bladder. The few that die of this condition represent the most acute cases, and, as they are of short duration only, the study of stone formation is practically impossible because of the early stage of development of the same. These facts turned my attention to the liver and its ducts. Here

we find obstruction and inflammatory conditions combined; here in cases of common duct obstruction and secondary cholangitis the conditions obtained by the animal experiments are paralleled. In these cases, which unfortunately for this investigation are rather rare, nature reproduces the conditions that Naunyn thought underlay the process of gallstone production. The conditions are purely local; there is stagnation of bile and there is inflammation of the mucous membrane of the bile passages. If it were possible to obtain a sufficiently large number of human livers with the above conditions present, the correctness of Naunyn's views, as well as the direct applicability of the results of animal experimentation, might be verified and the theory of gallstone production in human beings would rest on a firm basis.

I was able to collect 12 cases at autopsy[1] in which there had been a common-duct obstruction for more than four or five weeks, and in which a more or less severe inflammation of the extra and intrahepatic ducts had developed. In 7 of my cases the common duct was obstructed by calculi, in 5 by tumors of various kinds. *In the first series of 7 cases, as a result of the conditions of the experiments stones formed in the liver-ducts. In the second series of 5 cases, though apparently the same conditions were present, no stones developed, though stagnation of bile and inflammation of the mucous membrane of the bile passages were present.* In this second series Naunyn's causes were present just as in the first series, but no stones developed. How are we to explain this difference? Why should gallstones be produced in the liver-ducts in one series and not in the other? Is it mere chance that cases with previous cholelithiasis regularly showed stone formation in the liver-ducts, when common-duct obstruction due to stone and cholangitis developed, while those that had no previous stone formation did not develop stones, when stagnation of bile and cholangitis developed?

The absolute regularity in the results seems to me to preclude chance, and even though my series of cases be small, I think it points to a new factor in the production of gallstones. It is needless to theorize at this stage as to what this factor may be. If, to make my point clearer, we call the third factor an altered liver metabolism or a diathesis, we could understand why stones developed in the liver-ducts when stagnation and infection developed in cholelithiasis cases (they having the predisposition as evidenced by the older stones), and why they would not develop under similar conditions (second series) where no liver disturbance or diathesis obtained. But the term diathesis is vague and almost meaningless, merely a garb for ignorance. Perhaps, however, a faulty hepatic metabolism underlies the formation of gallstones?

[1] Similar cases of the clinical surgical literature have been brought together by me in a paper entitled "Intrahepatic Cholelithiasis," Medical News, 1904.

A larger material bearing on this subject could readily be gathered by the members of this Society without entailing any great trouble, and a larger material would help to clear up this difference that I have described between the cases of old cholelithiasis and those without cholelithiasis. And, as I said at the outset, it was with the purpose of enlisting your assistance that I read this paper.

In closing I may sum up the results that I have obtained as follows:

1. *Naunyn's factors—stagnation of bile plus inflammation of the bile-passage mucosa—do not seem to be sufficient by themselves to lead to gallstone formation, even though the time allowed for the working of the causes be adequate.*

2. *My first series of cases shows that these two factors lead to stone formation in patients who previously had gallstones. In this series we have the first real evidence of the factors underlying gallstone production and the causes of cholelithiasis in human beings.*

A CONTRIBUTION TO THE DOCTRINE OF THE MORPHOLOGY OF THE BLOOD, DERIVED FROM EXPERIMENTAL TOLUYLENDIAMINE POISONING.[1]

By Privat-docent Ernst Schwalbe, M.D.,
of Heidelberg,
and
John B. Solley, M.D.,
of New York.

The advances made in staining methods in recent years have increased the range and certainty of our classification of changes in the morphological elements of the blood. This was notably the case after the application of Ehrlich's method, a fact which may have led that author to state so optimistically that the doctrine of the changes in the blood, in as far as it depends upon morphological investigations, especially with the aid of color analysis, belongs to the, for the greater part, enlightened chapter of general pathology, and appears to have reached, provisionally, a definite conclusion, so that, essentially, only a few points remain to be cleared up.

Against this encouraging view is the constantly increasing list of contemporary works dealing with the blood morphology from clinical, pathological, and anatomical standpoints. As example, one

[1] Based upon a series of experiments conducted under Dr. Julius Arnold at the Pathological Laboratory of Heidelberg in 1901.

Schluss-betrachtung zu der Leukaemia, Bd. viii. der spec. Pathologie u. Therapie, Wien, 1901.

needs only to mention the diversity of opinion still held as to the genesis of erythrocytes and leukocytes. Furthermore, the terms "immunity, hæmolysin," etc., of rather recent coinage, suggest possibilities of undiscovered facts just over the borderland of morphology and intimately related to the latter. It seems difficult, therefore, to exclude the possibility of morphological conditions and changes, too fine to be detected by our present technique, occurring in the blood under the influence of toxic substances, bacterial poison, etc.[1] In conclusion, it is to be noted that even the firmly established doctrine of leukæmia and "typical anæmia," as based upon clinical evidence, is constantly meeting with opposition, in the light of more recent investigations.

In undertaking the following experimental study with toluylendiamine, we were impelled by the belief that blood morphology is still an unexhausted field containing details important for our knowledge of clinical phenomena. The mode of attack was influenced strongly by the strikingly analogous phenomena in the physiological process of coagulation as compared to the changes occurring in the blood in various anæmic conditions. It was Alexander Schmidt who pointed out this analogy.

In studying the process of coagulation, he produced artificial anæmiæ experimentally and compiled facts of intense interest and importance. To follow with understanding the points to be discussed, presupposes an accurate knowledge of the morphological processes in coagulation.[2] The necessity of being familiar with the physiological changes in the blood in judging of pathological processes is self-evident.

By employing toluylendiamine, the authors hoped to produce an artificial anæmia that might bring light to bear upon some questions of urgent clinical importance; also to have an opportunity to study such an anæmia throughout its course. In many cases of anæmia there are morphological changes to be indicated in two directions: of degeneration, of regeneration. As is well known, the differentiation is often very difficult, in fact, thus far well-nigh impossible—*e. g.*, the nature of the basophile granules in the red cells. The analogy presented by the phenomena of coagulation is encouraging, however.

Some authors maintained that many poisons produce typical morphological changes.[3] Comparing the result of our experiments with those of other investigators and inducing here the earlier results

[1] For example, the ring-like structures recently found by Cabot (Journal of Medical Research, February, 1903) in the red cells with Wright's modification of Leischmann's stain.

[2] Schwalbe. Ueber Blutgerinnung, 1900.

[3] This view was held by Heinz, Limbeck (Wiener klin. Wochenschrift, 1893), and Parlier, and opposed by Maragliano and Castellino (Zeitschrift f. klin. Medizin., Bd. xxi.). Ehrlich also expressed himself against Heinz (Ueber schwere anaemische Zustände, Verhandlungen der XI. Congress f. innere Medizin., 1892).

attained in studying coagulation, a further explanation of the conclusions to which we were lead seems possible.[1]

Through the agency of toluylendiamine, we hoped to bring new material to the question of the province of the blood plates; to get closer to the structure of the red cells, and to ascertain, to a degree, at least, the significance of the hæmoglobinæmic "inner bodies;" and finally, to verify or refute conclusions derived from earlier investigations.

Toluylendiamine[2] was first employed by Stadelmann to study icterus. His first conviction that the blood was not affected by the poison was later relinquished after Afanassiew's demonstration of the marked changes in the red cells. The drug was then used by many as a poison and Afanassiew's observations were confirmed. The action of the toluylendiamine varies greatly in different animals. As a rule, canines form the best subjects for study; moderate dosage is followed by marked icterus and high-grade changes in the blood. Hæmoglobinuria is the exception, in distinct contrast to the effect in cats, in which hæmoglobinuria is intense and almost constant, the icterus being secondary and often absent. In dogs, if the dosage is given carefully as to amount and time interval, the icterus soon disappears and the animal becomes active. In rabbits prolonged dosage can be effected without the appearance of icterus or hæmoglobinuria, but often with the production of a typical picture of severe anæmia. Rabbits, furthermore, tolerate enormous doses, especially by carefully graded increase. Guinea-pigs react much the same as rabbits; at least we have never observed icterus in either. In dogs a picture similar to that observed in rabbits can be obtained by working up gradually from very small incipient doses—namely, icterus is absent, but a severe anæmia develops. Icterus would, therefore, seem to be produced only by large single doses.

The effects of acute, subacute, and chronic poisoning were studied by means of fresh and dried blood specimens, treated by numerous staining methods. As material for investigation, chiefly dogs were used (six dogs, four rabbits, and two guinea-pigs). As to methods, there seems to be no question that wrong or one-sided conclusions can be avoided only by employing many methods and carefully comparing results. For fresh specimens, Arnold's Holland plättschen-

[1] Since the compilation of this article the views of many investigators have changed, and bear out our previous views against the specific action of various blood poisons. Bloch (Deut. Archiv f. klin. Medizin., 1903, Bd. vii. p. 277, cited by S. Batty Shaw, Practitioner, vol. lxxiii. No. 4), for example, in studying pernicious anæmia concludes that the same "must be due to some agent which interferes with the activity of the blood-forming organs," and found no evidence to support any toxic nature of this agent, "whether arising from disturbed internal secretory activity of any organ, or from digestive disturbance due to atrophy of the mucosa of the bowels, or to the occurrence of bacterial invasion." He also found that ingestion of toluylendiamine produced nothing more than secondary anæmia.

[2] Discovered by Hoffmann in 1861 as a secondary product in making aniline dyes.

method proved very satisfactory. Bettmann's method of using neutral red gave interesting results. To fresh specimens, many coloring agents were applied, neutral red and methyl violet being most satisfactory. In using the latter, however, the Holland disks have to be discarded on account of the attraction of the walls of the meshes for the coloring matter. To obviate this, one can employ Neumann's method, which consists in spreading the mixture of blood and coloring agent between a cover-glass and smaller square portion of a cover-glass and inverting the former upon a smeared hollow-ground slide. The dry specimens were fixed in the usual manner; heat, alcohol, ether, formaldehyde, formaldehyde vapor, etc., are all equally reliable when properly employed. At first numerous staining methods were tried, but were finally abandoned for Laurent's solution of eosin methylene blue, Engel's method (*Zentralblatt*, 1900), and hæmatoxylin and eosin. With Ehrlich's triacid stain the results were not satisfactory.

A detailed report of the records seems superfluous and liable to prove monotonous, being prolonged in some cases over months. Also a tabulated comparison of blood examinations, as first planned, would add nothing in clearness. The essential is a classification of the morphological changes observed and a description of the individual groups with illustrations. The literature of toluylendiamine poisoning can be dispensed with here for brevity's sake, careful study and review of the same being understood; also, all histological and chemical changes, such as were discussed in considering the processes of coagulation. That any such study as the present requires careful macroscopic and microscopic examination of all the organs as well, is self-evident. In the following we are concerned, however, only with a description of the blood as studied morphologically in fresh and dried specimens:

I. Changes in the red cells.
Blood counts in anæmic conditions. Degeneration. Regeneration.

a. Phenomena of budding. Process of expulsion of parts of red cells. Question of the blood plates.[1] Intracellular hæmoglobinæmic bodies.

b. Other phenomena of degeneration.
Poikilocytosis. Polychromatophilia. Microcytosis. Macrocytosis. Shadows.

c. Granules in the red cells.

d. Appearance of nucleated red cells in the blood and loss of nucleus in same.

[1] The classification of blood plates under red cells, and not separately, is not in accord with many recent articles on the subject, but is the result of conclusions stated elsewhere (Schwalbe, Anatomische Anzeiger, 1900, Bd. xx.), for it is not possible to regard the blood plates as other than products of the blood cells, especially of the red cells.

II. Changes in leukocytes.

Results of counts. Granules in white cells. Changes in the white cells not being recognized as referable especially to the action of toluylendiamine will be treated secondarily.

The various investigators are agreed, as a glance at the literature will show, that more importance is to be attached to the changes in the red cells than to those in the leukocytes. That the red cells are markedly influenced by toluylendiamine is clear from the clinical course of the chronic poisoning, in which all the features of a high-grade anæmia are present, intense emaciation and striking pallor of all visible mucous membranes. The blood count as obtained by Biondi and Bernhardt, also by Heinz, confirms the clinical picture. The blood counts made during the present study correspond in every case, the unusual oligocythæmia being readily recognized. One source of error should be considered, however; as mentioned in the literature, the red cells of poisoned subjects have a greater tendency to disintegrate, that is, a diminished resistance. It is certain that the conditions under which cells are counted further diminish their resistance, as a result of which the count obtained may be lower than is the case. Even with this factor considered, the oligocythæmia is sufficiently positive to be notable. By means of the count the possibility is excluded of the strikingly pale blood being caused somehow solely by decrease in the quantity of hæmoglobin.

One of the most interesting phenomena observed in the red cells is connected with the formation of the blood plates, the budding of the erythrocytes. The process is studied most satisfactorily in fresh blood specimens from a dog freshly jaundiced by toluylendiamine when examined in the Holland disks as described above. The common "thorn-apple" forms are seen in great numbers. Presently the budding process begins, the buds varying in size. A protrusion forms upon some part of the red cell, the part affected often showing a lustre differing from the rest of the cell. The projecting part becomes hemispherical, and, often with amœboid movements, gradually becomes more detached from the cell till the uniting pedicle divides the "pre-existent" blood plate.[1] Two points worthy of note are that from the outset of the study the number of blood plates and amount of budding were greatly in advance of the same observed in normal blood, and that an extensive destruction of red cells took place in fresh blood while under observation. The inference is that the same sort of disintegration takes place as in coagulation, only much more rapidly under pathological conditions. In

[1] It is to be clearly understood that the movement of the bud in this process is not to be confused with the Brownian movement of particles, or attributed to capillary attraction or currents in the serum. The recent studies of surface tension by J. Traube (Pflüger's Archiv, December 1, 1904) bid fair to ultimately explain many, if not all, of the phenomena of amœboid movements and disintegration (budding of the blood plates, etc.) of the morphological elements of the blood.

other words, the resistance of the red cells is greatly lessened. An observation should be noted, which, without leading to definite conclusions, presents the possibility of significant deductions for the morphology of coagulation, namely, that in a dog in a condition of chronic poisoning at a time when, without icterus, a marked anæmia was present, surprisingly few changes were found in the blood in fresh specimens. This suggests invitingly the conception that in such cases the less resistant red cells succumb, the more resistant alone being left in the circulation. Its ultimate connection with the process of coagulation can merely be indicated. It is known that in artificial anæmias—*e. g.*, by repeated venesection, the coagulability of the blood at first increases, then gradually diminishes; also, that this decrease can reach a serious point. No attempt was made, in fact, no method is extant, to determine the rate of coagulation, so that any conclusions are impossible. These facts are of apparent interest, however, in assuming the possibility of some connection between these morphological changes and the process of coagulation.

In toluylendiamine poisoning the budding process is, therefore, apparently greatly increased, although this cannot be stated as a fact from simple observation of fresh specimens, especially when it is known that the budding process occurs with some irregularity in coagulation and that in toluylendiamine poisoning no method is known by which to accurately determine these changes. By admixture of some coloring fluid—*e. g.*, methyl violet salt solution, as described elsewhere,[1] as emphasized recently by Bloch and Heinz, the changes become more significant. Applied to normal blood, no coloring is visible at first in the red cells. As the budding process begins, many of the buds become more or less deeply colored with methyl violet. The red cells send out plump projections, staining blue in the same manner that the "pre-existent" blood plates stain with this fluid. After prolonged observation many red cells appear to contain a granule stained blue more or less deeply, as described elsewhere.[2] These blue granules seen in the red cells of normal blood resemble entirely the blue granules described by Heinz. In the blood of animals poisoned with toluylendiamine, the process is quite different. The blood from a dog jaundiced with toluylendiamine presents a beautiful picture; immediately after withdrawal the red cells are almost uniformly occupied by blue granules and blue projections, the greater number having only one visible blue granule; some having several. On careful inspection it is evident that all of the blue particles are projections; that they are the same as those seen in studying coagulation. Fig. 1, *a* to *e*, shows several of the forms seen immediately after withdrawal; many red cells have

[1] Schwalbe. Münch. med. Wochenschrift, 1901.
[2] Schwalbe. Anatom. Anzeiger, Bd. xx.

retained their form; some contain unstained as well as stained projections. All, or nearly all, of the red cells present this picture in the blood of jaundiced dogs; in rabbits or dogs which, though repeatedly poisoned, remain unjaundiced, the number is fewer. These phenomena are interesting in several respects: First, they challenge to a comparison with other poisons; Heinz, who has determined the effect of many poisons, found the same manifestations produced by some of the poisons when studied with gentian violet salt solution. He called the stained particles in the red cells "blue granules." Bloch regarded these blue granules as products characteristic of pyridin poisoning, and affirms that he did not find them in cases poisoned with toluylendiamine. That the "blue granules" of Heinz and blue bodies (Körperschen) of Bloch are identical with those found by us can be derived from the drawings of these two authors. This would seem to indicate that these phenomena are not characteristic for any particular poisons,[1] a point made more clear by comparison with the processes observed in coagulation, in which, in normal blood, the blue granules appear in the same manner, but in fewer numbers, and only after coagulation has commenced, whereas, in poisoned blood the granules are seen immediately on withdrawal. In both instances, therefore, we have apparently to deal with an injury of the erythrocytes, a degeneration, the difference in the blue granules and projections being quantitative rather than qualitative, the degenerative process in cases of poisoning occurring after the type witnessed in coagulation. It is possible, of course, that all poisons do not act upon the red cells in the same way, but produce types of degeneration too subtle for the present technique; the rapidity and energy of the injury to the blood cells is apparently of the same importance for the production of the morphological picture of poisoning, however, as the nature of the poison.[2]

Some few poisons act by choice upon the erythrocytes; others cause the production of methæmoglobin. The distinction is evident. In staining with methyl violet salt solution possibly the blue granules predominate in some forms of poisonings, whereas, in others (still beyond our power of detection) they might be much less numerous and conspicuous. If, however, there were changes in the red cells in a sense characteristic of certain poisons, or which only appear under the action of a particular blood poison or chemically allied substances, no evidence of such was found in these investigations, or is presented in the literature (Ehrlich, Limbeck, Maragliano, Castellino, and others). It seems further impossible, in view of the fact, as stated, that all degenerative processes in the

[1] In Heinz's more recent publications, the conception of specific changes for certain poisons is emphasized less strongly than in his earlier works.

[2] Ehrlich said in regard to the changes described by Heinz: "Personally I am of the opinion that in higher animals this degeneration will be produced by the majority, perhaps by all, of the blood cell poisons." (Verhandlungen d. XI. Congr. f. innere Med., p. 40.)

red cells, so far as it is possible to determine them with or without the aid of staining fluids, find their prototype in the process of coagulation. It remains to explain the relationship of the phenomena witnessed in studying coagulation and those obtained more recently, by means of methyl violet salt solution, to the "inner bodies" of Ehrlich (Hæmoglobinaemische Innenkörpenschen).

In fresh specimens the red cells are often filled with granules which have a stronger lustre than the rest of the cell. On closer inspection these are seen to be projections which are markedly hæmoglobiniferous. An unequal distribution of hæmoglobin in the structure of the erythrocytes in the most diverse ways is met with in fresh as well as dried specimens. Ehrlich regarded the hæmoglobiniferous "inner bodies" as the result of a degeneration of hæmoglobiniferous parts of the cell. In dried specimens the projections, which in the fresh specimens stain deeply with methyl violet, are eosinophilic, as direct comparison teaches. In fresh and dried specimens made simultaneously from an animal poisoned with toluylendiamine, the former show beautiful blue projections uniformly throughout the field, the latter (stained with eosin-methylin blue or hæmatoxylin) only occasional, faintly blue-tinged projection, among the red cells. In the one case they are, therefore, strongly basophilic; in the other eosinophilic, and occasionally also faintly basophilic. These qualities, taken into consideration with the altered appearance of the projections in unstained fresh specimens, point strongly to degeneration of the hæmoglobiniferous part of the cells. This is Ehrlich's view also, for in his publications he affirms the identity of the granules described by Heinz in his study of poisonings, with the "inner bodies." Conditions closely related to, if not identical with the "inner bodies," are present without question in toluylendiamine poisoning, and the transition to blood-plate production is a slight one, as will be explained. In dry specimens the projections are often beautifully shown, and of various sizes. Naturally conservatism is necessary in regard to the value of the appearances in dry specimens, as similar changes are seen as artefacts in the process of preparation. When, however, such buds are seldom seen in the preparation of hundreds of dry specimens from normal blood, in contrast to their almost constant presence, uniformly scattered throughout the field, in the blood from toluylendiamine subjects; when, furthermore, one can demonstrate the agreement of fresh and dry specimens, it would seem permissible to utilize dry specimens in the analysis of the findings.

Blood plates occur in dry specimens in clusters in the well-known manner; also separately, often in surprising numbers. Also the forms known as blood disks, with and without the presence of hæmoglobin. Stained with methylene blue or hæmatoxylin and eosin, the blood plates sometimes show a slight metachromosis, a tone partaking of the blue of the basic stain and of the pink of eosin. A

"nuclear" structure is often apparent, stained exquisitely blue, as described earlier by Arnold, and as emphasized recently by Deetjen especially (who, to be sure, gives another significance to it). Some of these plates, mostly of a delicate form, appear as if caught in amœboid movement in the preparation of the specimen, discrete or attached to a red cell, and with the nuclear structure stained blue (Fig. 2). That they are identical with Deetjen's findings is evident from a comparison of the drawings.[1]

Since Hayem and Bizzozero called attention to the blood plates in the seventies (they had been noted casually before by many authors) these bodies have claimed greater interest. The two essential questions in regard to them, their origin—thereby the question of pre-existence—and their significance in the processes of degeneration and coagulation, are still unsettled. Three views are extant as to their genesis; that they are thrombocytes (Dekhuysen), that is, independent pre-existent bodies in the blood, having the physiological importance of separate structures and constituting an essential third element of the blood, requiring explanation as to development and origin; that they are not pre-existent, but merely artefacts, globulin sediment and products of precipitation—an opinion with few retainers at present; that they are derivatives of the blood cells, either of the red cells, or white cells, or both. For a long time the leukocytes were regarded as the sole source by many eminent investigators. An extensive list of publications show, however, that the red cells are regarded as sharing at least in their production.[2] The participation of the blood plates in the process of coagulation has been observed repeatedly since Hayem and Bizzozero, and its significance variously interpreted. The works of Arnold, Franz Müller, Feldbausch, and Schwalbe should be mentioned in this connection. From prolonged observation of the budding of the erythrocytes in fresh specimens, with and without the admixture of methyl violet salt solution, it is difficult not to connect this phenomena with the increased production of blood plates. This was also the observation made by Arnold, and later by Schwalbe, in studying coagulation, and which led to the same conclusion, namely, that the blood plates are buds from the erythrocytes. As previously stated, blood plates were found in large numbers in fresh and dry specimens from poisoned dogs. In dry specimens the blood plates often found attached to the erythrocytes can be explained in two ways: either that a bud has been caught in the act of emerging from the red cell—a process often seen in fresh specimens—or that a blood plate has wandered to the red cell and become adherent—a process that unquestionably also occurs frequently. But to determine in the dry

[1] Virchow's Archiv, Bd. clxiv.

[2] Interesting in this connection is Stengel's excellent review of the recent literature (Progressive Medicine, June, 1902), and his views in support of the latter theory, published after the initial compilation of this paper.

specimen between the two is hardly possible. One feature is striking, however: in Fig. 2 red cells are seen with a dell at the point of attachment of the blood plate, giving the impression of a loss of substance at that point. In such cases it may not be too daring to assume that the loss of substance is due to exodus of the blood plate at that point. Furthermore, comparing the fresh and dry specimens: in the dry specimens the supposedly budding blood plate contains a nuclear-like structure stained distinctly with hæmatoxylin, the "nucleoid" of Arnold, the nucleus of Deetjen, Dekhuysen and Kopsch.

Fig. 2, *h*, shows a blood plate with nucleoid, and in addition, hæmoglobin stained with eosin. This observation, namely, of blood plates that contain a nucleoid body staining with hæmatoxylin or methylene blue, and that are also hæmoglobiniferous and stainable with eosin, has been seen repeatedly, not only in the pathological specimens, but also in normal blood. Unless this be purely adventitious, it speaks clearly for the erythrocytic origin of the blood plates. It should be emphasized again that the findings are taken into account only in support of this view and that the comparison of fresh and dry specimens is very striking. The conviction that the blood plates are divided from the blood cells is founded not only upon the phenomena studied in fresh and dry specimens under normal and pathological conditions and upon the observations made in following the process of coagulation; it is also verified by Arnold's investigations of circulating blood, especially his extensive study of thrombi treated by the most diverse methods. The objections to the deductions of Deetjen and Kopsch and the opinions of Hirschwald have already been published.[1]

The usual changes present in anæmic conditions were also found in toluylendiamine poisoning, namely, the so-called shadows (to which Afanassiew referred especially in connection with toluylendiamine poisoning), poikilocytosis, and polychromatophilia. In how far the latter is to be regarded as an indication of degeneration is beyond discussion here. The striking variation in the size of the red cells, especially the presence of very minute forms, is noteworthy.

As to the granules in the red cells: basophile granulation of the red cells was described at an earlier period by Askanazy and others, but not until after the studies of A. Plehn did any great number of investigators begin to turn any particular attention to them. Among the more recent work should be mentioned that of Grawitz, Litten, Hamel, Bloch, Isserlin, Cabot, Fisch, and Stengel. Plehn, whose views are compiled and beautifully illustrated in the monograph of 1901, believes that certain basophile granules of the erythrocytes, found in the blood of malarial patients subsequent to recovery, are

[1] Schwalbe. Anat. Anzeiger, Bd. xx.

to be regarded as latent forms of the plasmodium. It is interesting that later, after Plehn's view was rather generally refuted, Bloch, after examining Plehn's specimens—having previously disputed Plehn's contention—came to the conclusion that the granules in Plehn's specimens were with great probability of a different nature from those described by himself and others, and that therefore Plehn's view could not be rejected without further proof. If Plehn's view is correct, it presupposes the existence of two distinct kinds of basophile granules; one characteristic of latent malarial parasites alone; the other common to, if not constant with, the most diverse forms of anæmia; the anæmia of Biermer, of carcinoma, of different toxic conditions. It is difficult to reconcile the present literature with Plehn's view, though only a systematic study of malarial blood would justify any conclusions.[1]

The granules seen in toluylendiamine poisoning correspond throughout with those described by Grawitz, Litten, and others. In dog's blood they are not constantly present. Guinea-pig's blood gives the most beautiful granules, both under normal and pathological conditions. In normal blood of healthy rabbits the granules are also present, but less frequently than in guinea-pigs. Bloch states that he did not find them in normal blood of guinea-pigs. Engel found them in the red cells of embryonal mice. In the guinea-pigs studied there was a marked variation in the size of the granules, both in the polychromatophilic and otherwise normal red cells. In dog's blood, in which, as stated, they were present only in poisoned cases, the variation in size was even more marked. They were most frequent in the chronic cases, rare in acute cases. The large granules are to be regarded apparently as "nucleoid" (Fig. 3, *c-e*). These resemble the nucleus of the blood plates described by Deetjen. In Fig. 3, *a*, *b*, *f*, and *k*, the granules or nucleoid is surrounded by an apparent concentration of hæmoglobin, that is, a "hæmoglobinæmic

[1] Since this paper was first drafted an opportunity was offered in June and July, 1902, to study a series of over thirty cases of malaria in New York. They were all tertian, six were double. In only two cases were granulations present in addition to a frequent poikilocytosis and polychromatophilia. In all others no granulations were found even weeks after recovery. Jenner's and Laurent's stains were used, the latter bringing out the variations in color in the manner produced by Wright's modification of Leishmann's stain. The two cases presenting granules in the red cells were in adults with a double tertian infection of three and four weeks duration respectively. In the specimens from both cases numerous granulated red cells were found containing in addition young hyaline bodies (Figs. 25, 26). The granules corresponded throughout with those seen in toluylendiamine poisoning, in some instances being large and fewer to a cell, in others smaller and more evenly distributed, especially throughout the periphery, with a tendency to ring formation. One of these cases presented normoblasts, and among them cells like those reproduced in Fig. 3, *i*, and Fig. 4. In neither case could hyaline bodies be found resembling in any way the large granules in Fig. 4; and, vice versa, one could not easily mistake such large granules for even the youngest hyaline bodies. These large granules correspond in size, form, and staining qualities, however, to the granules described and reproduced by Plehn as latent malarial organisms, and were found repeatedly, as mentioned, in the blood of toluylendiamine subjects. In the two cases cited, the large granules disappeared after administration of quinine, just as in the dog after cessation of the toluylendiamine dosage.

inner body," with nuclear substance. Prolonged observation of such forms raises the question as to whether they may be preparatory forms of blood plates in the stage previous to expulsion; at any rate, the indication is not easily disregarded.

As to the smaller granules, two views exist as to their province; that they are products of nuclear degeneration of nucleated red cells; that they are the expression of degeneration of the hæmoglobiniferous protoplasm. It is not inconceivable that they are evidence of regenerative processes. Bloch, who discusses these phenomena at some length, regards them as evidence of protoplasmic degeneration. One fact against the view that they are connected with nuclear degeneration is that they are found in red cells whose nuclei are undergoing mitosis (Fig. 12). Until further evidence can be produced, however, Bloch's view must remain unchallenged.

In mitosis the entire cell is concerned, protoplasm and nucleus both being involved in the process of division. It seems inconceivable that nuclear degeneration is to be inferred from the presence of granules in a cell whose nucleus is in a condition of growth. The same argument is to be brought with scarcely less probability against protoplasmic degeneration. Assuming that the protoplasm and nucleus of a dividing cell are under the same conditions, the protoplasm must also be in a state of productive activity. The view is not untenable, however, that the nucleus, in preparation for mitosis, rids itself of certain useless material which is manifested in the shape of granules. The same may be true of the protoplasm. Bloch's findings present nothing definite for or against nuclear or protoplasmic degeneration or even the possibility of some other significance. The deductions of Engel, establishing these granules as nuclear fragments, are at least not disproved by Bloch.[1]

In studying the process of coagulation in normal blood, basophile granules were found, which stained with methyl violet and varied in size like those seen in fresh specimens in toluylendiamine poisoning, the latter being mostly large and regarded as being associated in some way with the production of blood plates. The finer granules found in dry specimens cannot be classified unqualifiedly with the above. Whether they are similar to the finer granules seen in fresh specimens when stained with other fluids—*e. g.*, neutral red, is an open question beyond discussion here.

As to the granules being nuclear fragments or products of degeneration of the hæmoglobiniferous protoplasm or capable of other

[1] Cabot (Journal of Medical Research, February, 1903) thinks the granules found in various anæmic states may be due to over-ripeness of the cell or to degeneration of the protoplasm. But with Schmidt and others he believes that they are derived from the nucleus, and not from the protoplasm, whenever changes occur in the nucleus of a degenerative or regenerative character. The ring-like structures found by Cabot in some cases of pernicious anæmia, lead-poisoning, and lymphatic leukæmia mentioned in a previous foot-note, are regarded by that author as having some possible connection with the granules, and as probable derivatives of the nucleus in the same way as the basophile granules. Unlike the latter, however, they do not stain with hæmatoxylin. No special significance is attached to them.

interpretation, a uniform explanation, in the sense that only one or the other possibility is to be admitted, seems improbable. Both may apply. Still another possibility is that cited by many investigators, especially Arnold, namely, that the protoplasm of the red cells may have a granular structure, hidden by the hæmoglobin under ordinary circumstances. Clinical experience speaks fully for the existence of changes in the hæmoglobin leading to destruction of the same without disintegration of the cell form, as, for example, in the so-called shadows. One is often reminded of this possibility by appearances observed in the red rells in fresh and dry specimens, and of the further possibility that such conditions may be revealed to us by the aid of finer technique.

In toluylendiamine poisoning, as in every case of anæmia the course of which is not ended rapidly by recovery or exitus, the process of degeneration is accompanied by an attempt at regeneration. It has been established that even after intense icterus the animal can recover. Nucleated red cells are found as an expression of this attempt at regeneration. Ehrlich classified normoblasts, megaloblasts, and microblasts. In toluylendiamine poisoning normoblasts were preponderant, megaloblasts being rare. It is well known that a differentiation depends more upon nuclear characteristics than size, and that it can at times be very difficult to distinguish between the several forms. In rare instances very minute nucleated forms have been found (Figs. 20, 21) that must be regarded as microblasts. Further description of the various forms observed is not essential here (Figs. 5 to 21). Many can be classified as normoblasts by the nuclei apart from the size. Some nuclei contain a more deeply stained nucleolus. In some instances mitosis is present (Fig. 16); in others two discrete nuclei are found in a cell and the protoplasm "laced in" between them (Fig. 18). This observation of mitosis in the circulation has been made repeatedly. Triform division of the nucleus has also been seen in the specimens.

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Fig. 1,[1] *a–e*. Dog V. Red blood cells as observed in fresh specimens. Methyl violet salt solution.

Fig. 2, *a–p*. Dog I. Blood plates with nucleoid, in part free, in part attached to red cells: *e*, *f*, *g*, show cell at point of attachment; *h*, red blood cell with blood plate containing nucleoid and hæmoglobin stained with eosin. Hæmatoxylin and eosin.

Fig. 3, *a–k*. Different-sized granules in the red cells, hæmatoxylin and eosin: *c*, the large blue-stained granules represent the "nucleoid" of the blood plate, also in *d* and *e*; *i*, nuclear degeneration and fine granules; *j* and *k*, fine granules and a large granule.

Figs. 4–8, 10–12. Dog VI. Nucleated red cells with granules. Laurent stain.

Fig. 8. Polychromatophilic nucleated red cell with granule.

Fig. 9. Guinea-pig. Nucleated red cell with granules. Laurent.

Fig. 13, *a*, *b*. Dog II. Nucleated red cells. Hæmatoxylin and eosin.

Fig. 14, 15, 16. Dog I. Nucleated red cells. Hæmatoxylin and eosin.

Fig. 22. Expulsion of nucleus.

Fig. 23, *a*, *b*, *c*. Dog IV. Small lymphocytes. Eosin methylene blue.

Fig. 24. Normal red cell for gross comparison.

Figs. 25, 26. Red cells containing granules and hyaline malarial organisms.

[1] Fig. 1 drawn by Schwalbe, the rest by Solley.

FIG. 1

FIG. 2

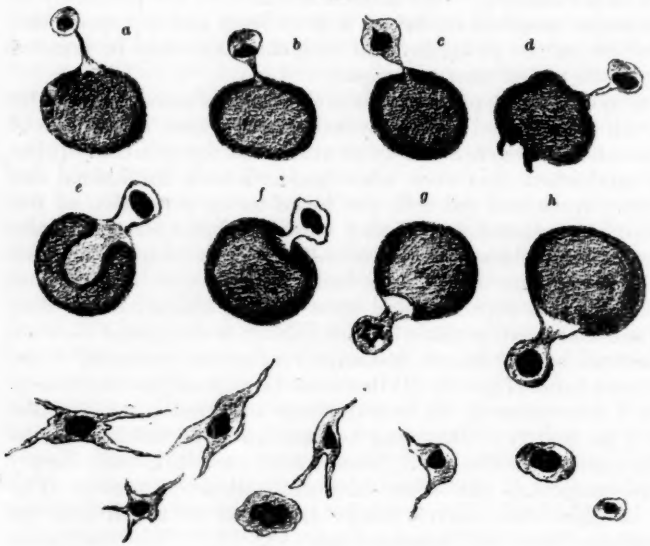
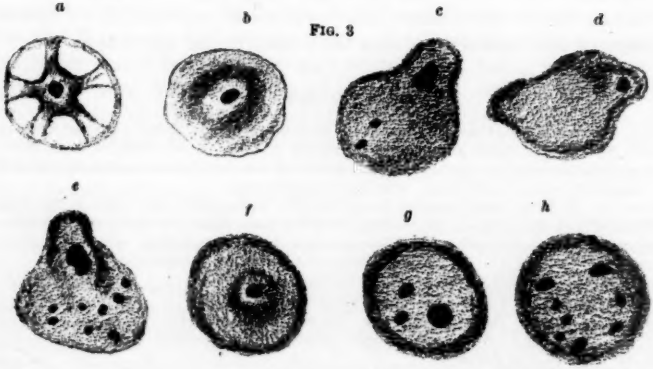


FIG. 3



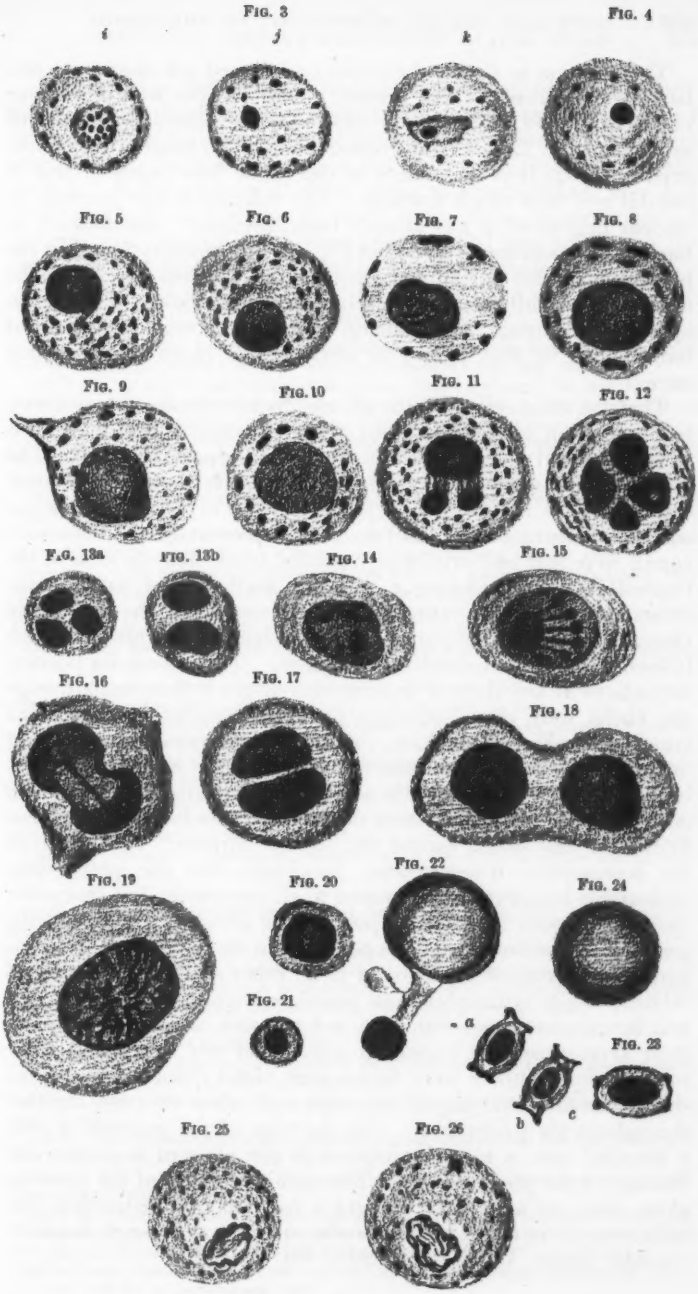


Fig. 3
Fig. 4
i
j
k
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12
Fig. 13a
Fig. 13b
Fig. 14
Fig. 15
Fig. 16
Fig. 17
Fig. 18
Fig. 19
Fig. 20
Fig. 22
Fig. 24
Fig. 21
a
Fig. 23
b
c
Fig. 25
Fig. 26

The question as to how the nucleus of the red cell disappears can be little influenced by the present study. There were numerous instances of free nuclei in the blood and of others in the act of expulsion (Fig. 22). Disintegration seems to go hand in hand with expulsion, but it is impossible to determine how much of this is natural and how much artificial. The relation of the granules to nuclear degeneration has already been discussed. An instance of nuclear degeneration is shown in Fig. 3*i*, one of many found in the blood from a dog during acute poisoning. In fresh specimens the nuclei stain rapidly and beautifully with methyl violet. There is no apparent advantage in Bettmann's method of employing neutral red, applied by that author in studying the blood of embryonal mice.

That the white cells are little affected by toluylendiamine is shown by observation, as well as a study of the literature. Accurate counts usually denoted a slight leukocytosis, never a hypoleukocytosis. The increase must generally be regarded as relative, however. Biondi claims to have found a leukocytosis to twice or thrice the normal count and regarded it as absolute. In the present observations such counts were rare and cannot be regarded as absolute, in view of the impossibility of employing a counting method that will exclude errors due to disintegration of the red cells and the constantly changing proportion of morphological elements to serum under the influence of the toluylendiamine dosage. There were no positive indications at any time of degeneration of the leukocytes, although the nuclei were often strikingly pale. A peculiar form of small lymphocyte (Fig. 23, *a*, *b*, *c*), found in several cases, is worthy of mention. Interesting granules were found in the leukocytes, which could not be referred to specific action of toluylendiamine, and which could not be considered here without regard for the enormous literature, that would exceed the present purpose. Hirschfeld, in his comparative investigations, concludes that the polynuclear eosinophile leukocytes are common to all mammalia, but that every species possesses in addition polynuclear leukocytes with specific granules. The human species possesses in its neutrophile granular leukocytes a specific form found in no other animal. In poisoned rabbits, beside eosinophile and pseudoeosinophile leukocytes, certain forms were found with large red granules, which, by reason of their arrangement and unusual size, could not be classed with eosinophiles. Others were found with violet granules of varying sizes, sometimes varying in the same cell, often crowded together throughout the protoplasm. The doctrine of the granules is such a disputed one as to make impossible any attempt to discuss the findings of the present study. The staining quality of the granules alone does not apparently present a fundamental distinction, but rather stands in direct relation to the condition of the cell function. (Arnold; Hesse, Virchow's *Archiv.*, Bd. clxvii.)

In conclusion, the changes found in the pathological processes produced by toluylendiamine poisoning are the same as those observed in many other toxic and anæmic conditions and find their analogy essentially in the changes seen in the study of physiological degeneration. If the purpose of these pages is accomplished, they will serve as a help or incentive to others to use these observations and deductions in studying and attempting to shed new light upon the manifold and complex questions of blood morphology.

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XEROSTOMA.

BY LEWIS S. SOMERS, M.D.,
OF PHILADELPHIA, PA.

WHILE a relative degree of aptyalism, or more correctly partial suppression of the buccal and salivary secretion, is not uncommon as a result of the administration of atropine, or occurs during the course of various infections such as typhoid fever, and is also dependent upon long-continued mouth breathing from obstructing adenoid masses in the nasopharynx, yet as an independent affection *per se* this condition of xerostoma, or dry mouth, is exceedingly unusual.

Symptomatically, the affection consists essentially of a great diminution or almost complete arrest of both the secretion of the salivary glands and the numerous mucous glands of the buccal interior, while the symptom-complex thus produced evinces such a clear and definite picture that but little basis exists for confusing it with any other condition. What may be designated relative xerostoma is also found, in addition to the conditions previously mentioned, in diabetes and as a physiological state in old age to a moderate degree, while a somewhat analogous condition has been described by Heerat as psychic salivation. In four cases of the latter, which he studied, there was continual spitting without apparent cause, the patients considering it necessary to get rid of the mouth secretions. The saliva then became repugnant to such a degree that it was no longer swallowed, and as a result of this psychic state the glands were at first stimulated to increased secretion, which the patient constantly expectorated; while as a later phenomena dryness of the mouth resulted. In true xerostoma, however, while the excessive dryness is the most prominent symptom, yet other evidences of a more serious nature are associated with it and, as in the few cases recorded since it was first recognized by Hutchinson, the affection seems to deviate but little in every instance, it occupies

a somewhat limited field by itself; while, as no constant histological lesions were found in the cases that have come to autopsy, the etiological factors concerned in the production of this affection still remain obscure.

The various theories that have been evolved in this respect are most diverse, yet all seemingly having an underlying basis of a nerve origin of the disease. In some the first appearance of the xerostoma seemed to bear a close relation to a fright, an hysterical condition, malnutrition, worry, or mental overwork, while in a case seen by Shurly locomotor ataxia was present. It has been suggested that the affection is the result of derangement of some problematical centre governing the glands of this portion of the alimentary and respiratory mucosa, as in not a few of the reported cases coincident trophic changes were also found in other portions of the body; so that these cases at least strongly imply either a central change or a neurotic affection involving in part the peripheral trophic nerves. In the case reported by Harris there was complete arrest of the salivary and buccal secretion, and, in the absence of any apparent organic disease, he regarded the xerostoma as a functional neurosis; while, from the records of 12 other cases, he believes that it is not dependent upon any disease of the parotid glands, but that it is due to an affection of the nerve supply of all the glands of the mouth.

In this connection the case reported by Chappell is of great value. The affection was seen in a female forty-six years of age, and in in addition to the mouth dryness, the eyes, nose, larynx, and trachea were also involved in the same manner. Four years after the onset the parotid glands would intermittently swell, become tender, and again in a few days would subside to their normal condition. The dryness of the mucosa was complete, continuous, and the lining of the buccal cavity was sprinkled with small particles of food which adhered to the surface and produced a constant desire to drink and clear the mouth. As the teeth decayed within a year after the appearance of the first symptoms, they all had to be removed; later both parotid glands were much enlarged, nodular, hard, and non-sensitive; while the submaxillary and the lowest of the posterior chain of the cervical glands were also enlarged. Medication, locally or internally, had no appreciable effect in producing mouth secretion, and the taste was markedly impaired. As the result of the death of a friend, she suddenly lost the use of the left arm and leg, but after being confined to bed for some time there was a partial return of power. The parotid enlargement then increased, and a few weeks later she became drowsy, could only be aroused to take nourishment; then complete paralysis of both arms and legs occurred, followed shortly by death.

The nervous element in this case, of course, was well marked, more so than is usually found; but among reported cases three had a rapid onset, one a severe mental shock, another was in an hysteri-

cal woman with anuria, while still another was a hypochondriac. It has also been suggested, without any definite basis, however, that the condition of the mucosa results from the loss of certain unknown constituents of the saliva, but this theory appears somewhat problematical, although, with further studies made in the chemistry of the mouth and pharynx secretions in relation to various local conditions, this problem may in time assume a clearer aspect than it does at present.

Xerostoma is essentially an affection of middle age or later years, and is exceptional in those under forty. It is also found mostly in the female sex and, with but few exceptions, males have not seemed to be affected with the condition. As exceptions to this age at which it first appears, are the cases seen by Riesman and Osler. In the former's patient the woman was thirty-eight years old, and, in addition to a dry, pasty feeling in the mouth and throat, she had burning pains along the course of the inferior maxillary nerve. The tongue was red, bare, and studded with petechial hemorrhages on the under surface. While in the case seen by Osler, that of a male aged thirty-two years, which seems to be the youngest reported case, there was a peculiar growth along the alveoli, consisting of remnants of food which had collected, become hardened, and adherent as the result of the absence of salivary and buccal secretion.

The case which came under my observation was that of a male, German, aged, seventy-six years. No occupation. He complained of excessive dryness of the mouth, pharynx, and larynx, with constant spitting a material of a pasty character, and resembling boiled starch. His family history was negative, both parents living to old age; his sister being well at eighty-one years, while his two children died at an early age of tuberculosis. At twenty he had gonorrhœa, but gave no history or evidence in any way of syphilis. At irregular intervals, from 1870 to 1872 inclusively, he was in a hospital with prurigo (?), and the itching was intense for a period of about three years. Had chronic cystitis and enlarged prostate for twelve years, but this no longer concerns him at present. Other than this he has been perfectly healthy until four months previous to when he was first seen, when he had a slight sore throat, and this was followed in a few hours by the sudden development of excessive dryness of the mouth.

Examination at his first visit showed a tall, large-built man, apparently in perfect health, and of unusually strong physique. He walks several miles daily for exercise without fatigue, but gets extremely nervous and trembles without cause. As he has tried a multitude of remedies for his mouth condition, without obtaining the least benefit, his nervousness has increased and at times he becomes melancholy, so much so that on several occasions he has considered the question of suicide. He is a rapid talker, although his voice is normal, and he shows a marked nervous element when

he speaks. He is now devoting his entire time to the condition of his mouth, and greatly fears that the affection is incurable and progressive and that it will ultimately kill him. He rests normally at night, has no trouble to get asleep, but when he is awakened his lips and mouth burn. His memory has failed to a considerable extent, but no gross nervous changes are demonstrable. His temperature and pulse were both normal, and remained unchanged during the entire time that he was under observation. He has always used alcohol in moderate amounts, but now it makes his mouth dry and burning, although he still takes a small amount before breakfast, but does not touch it during the day. His teeth commenced to decay several years before the xerostoma developed, and about a year previous it became necessary to extract all the remaining stumps and wear a plate, which he uses constantly, as the mouth feels better when it is in place. Before the present condition developed he weighed 165 pounds, but now his weight is 146 pounds and he states that the constant worry over his condition has broken down his health, but his general appearance belies this. He complains of a sweet taste constantly present, the lips pain and sting, while the tongue feels dry and sore to some extent. His mouth is not as dry at night as during the day, as during the latter time he has to make an attempt at expectoration every ten or fifteen minutes, at night he only has to do it once or twice. On some days, but rarely and with no appreciable cause, the dryness will not be as annoying as at other times, and on account of this dryness he has a constant desire to clear his pharynx and mouth of the very small amount of thick, starchy material which takes the place of the saliva.

Examination shows olfaction to be normal; the middle turbinals on both sides of the nasal chambers are slightly enlarged and all the tissues of the nasal interior show well-marked evidences of sclerosis. The nasopharynx and pharynx are sclerotic and devoid of moisture, while the larynx interior presents the same appearance. The mouth is exceedingly dry; the mucosa has a shining appearance and a very small amount of moisture is present, so that the tissues are not absolutely dry. At the sides of the tongue, where small pools of saliva are normally present, they are absent, or consist at the most of a few white, tenuous bubbles. The palate and buccal walls respond feebly to the touch of the sharp probe, but motion is normal except from the restriction imposed by the absence of the saliva. The tongue is fissured, dry, and more or less covered with a layer of desquamated epithelial cells which proliferate and make up the bulk of what may be considered the saliva. The glands of the mouth and pharynx secrete a small amount of thick, viscid mucus, which from the admixture of epithelial cells is white in color and from the constant attempts at expectoration is seen in the mouth as firm elastic bubbles. The reaction of the saliva is acid. The right parotid gland is slightly enlarged and lobulated, the left is

normal in appearane, while both submaxillary glands are slightly enlarged. As regards taste, sweet and saline show no change from the normal, but acid is only recognized after contact for several minutes and bitter is also appreciated after a considerable lapse of time. The urine has a specific gravity of 1012, acid reaction, no sugar, no albumin or casts, but contains considerable bladder mucus and other than this is normal.

As far as treatment was concerned, nothing used was of any permanent value and after a lapse of six years the condition remains unchanged. At various times he was given at bedtime pilocarpine, gr. $\frac{1}{24}$, dissolved on the tongue, which produced a slight increase in the secretion, but this rapidly became useless and no better results were obtained with $\frac{1}{12}$ grain. Potassium iodide, commencing with 5-grain doses and increased to 60 grains, produced no beneficial effects even after several months of use. Menthol in strong solution in a hydrocarbon oil applied locally several times daily gave also negative results, while at this time my notes show that no change has occurred in his condition and nothing that has been done for him has had any effect upon the xerostoma. Fluid extract hydrastis, 5 drops in water, was used as a mouth wash, and 3 drops were given internally three times daily with no change in the mouth and an increased dryness of the laryngeal mucosa. At this time he became very much depressed over his condition and within three months had lost twenty-five pounds in weight, while nothing that had been done for him had been of the least benefit. He was given undiluted peroxide of hydrogen to use as a mouth wash as required, but its first application produced such an excessive effervescence from the enormous amount of desquamated epithelial cells present in the mouth that it was diluted 1 to 3 parts with water, with the result that he never had anything to help him to such an extent. After a few weeks' use of the hydrogen peroxide the mouth still remained dry, but the desquamated epithelium had in great part been removed and the mucous membrane looked much cleaner than before. It was not long, however, before this failed and he was given menthol crystals to place on the tongue as often as the dryness became intolerable. Under this and other local and general medication, the condition from time to time grew worse or remained unchanged, although his general health did not seem to be greatly impaired; the upper respiratory tract appearing practically the same as when he was first seen, but the tissues showed more of an atrophied aspect, especially the larynx.

This case presents to a very close degree the usual group of symptoms seen in this affection, and it seems somewhat remarkable that the symptom-complex should be so similar in practically every case so far recorded, very little variations in this respect occurring in all instances. The case recorded by Sharp shows this similarity

very clearly, differing in but few essentials from the one forming the basis of this paper. The affection occurred in a woman of forty-one years and had lasted for eighteen months before she came under his observation. The buccal dryness came on suddenly after a nervous shock and the condition was worse when she was out-of-doors or near artificial heat. The odor of the breath was musty, chewing and swallowing had to be aided by sipping water frequently, while the mucosa of the lips, mouth and tongue was dry and glazed, dryness, however, extending only to the base of the tongue and not involving the mucosa of other portions of this tract. The tip of the tongue was red, the remainder was pale in color, while the papillæ were prominent. The salivary glands did not secrete but to a slight extent and the small amount of moisture occasionally present was slightly alkaline in reaction.

In not a few of the cases the general health remains unimpaired for a long period of time, the degree of the xerostoma apparently bearing no relation either to constitutional impairment or even to changes in the digestion, as is well shown in my case where the dryness was excessive, but the digestion was at no time deficient. In other instances the lessened secretion may be prominent as regards the nasal mucosa and also the lacrymal apparatus, and instead of beginning in the buccal cavity it may first be noticed in the former regions and later involve the mouth, pharynx, larynx, and trachea. The color of the mucosa is usually lighter than normal, or may present a bluish, congested appearance; it is uniformly dry and smooth and the absence of gland tissue macroscopically is very striking. Aside from the dryness of the buccal and adjacent mucous membranes, the tongue presents the most marked features, as it is usually red, lacks its epithelial coating in part, is fissured to a greater or lesser extent, and may have the appearance of a piece of rough leather or even of alligator skin. Anteriorly the papillæ are absent in cases of long duration, but the circumvallate papillæ remain unchanged. The mucosa of the buccal cavity and oropharynx may at various points be quite sensitive to the touch of a probe, while in other portions it is more or less anæsthetic, but these conditions vary from time to time and do not bear any fixed relation to the distribution of the nerves of this region. This hyperæsthesia of the mucosa when seen in a case of long duration, may interfere to some extent with deglutition, but as a rule, if swallowing and articulation are interfered with, it is the result of the dryness of the parts; while the taste is markedly diminished, or entirely in abeyance from the suppression of moisture in this region. Should the xerostoma be extensive there may be some impairment of the voice, an irritating cough may cause considerable annoyance, and gastric disturbance may occasionally arise, although it seems remarkable that the digestion remains but little impaired even when the salivary secretion is practically *nil* for long periods. In nearly

all the cases reported the urine was negative and organic changes of the kidneys or other organs were absent.

Among other prominent symptoms excessive dryness of the skin has been occasionally noted, while quite constantly the affection has been preceded or accompanied by dental decay and the gradual crumbling away of the teeth, until finally the patients would loose all their teeth. This latter phenomena is well shown in a case communicated to Chappell by Richardson, of a female, sixty years of age, who, after a severe nervous shock, developed headache, insomnia, and attacks of intermittent deafness. Three years before she first came under observation her teeth began to crumble away, so that nearly all had to be extracted. She then developed excessive dryness of the mouth, and on account of this found difficulty in swallowing food, so that she had to drink water frequently to aid in deglutition. Hall in a study of 39 cases of this affection obtained details of the disease sufficient to be of value in 36, and of these, 32 were females. The mucous membrane of the nose was involved in 10 cases, that of the eyes in 7, and the skin was dry in but a small number. There was crumbling of the teeth in a large number; while in several the onset was sudden, in 6 it followed severe shocks, and in most of the cases the cause was unknown. While nervousness and some degree of physical impairment is not unusual in cases of long duration, insomnia is occasionally complained of and the patient practically always exhibits great fear that the affection is malignant and incurable, this being a prominent symptom in my case.

As regards the implication of the salivary glands, the author last referred to found in 36 cases that the parotids were enlarged equally or unequally in 8; in 3 they were painful and tender; 1 gland ulcerated into the mouth; in 5 the increase in size varied from time to time, and in 1 of these it was most marked at the menstrual periods. He also found that with but one exception the other salivary glands were not enlarged. In cases where the parotid glands have been enlarged the ducts have remained pervious and unchanged, and one may be fairly accurate in stating that there are no constant pathological changes thus far ascertained of these glands. As a further study of some of the symptoms, Frazer found in 19 cases that 13 had dryness of the mouth alone, 3 had dryness of the mouth and nose, 1 of the mouth and eyes, and in 2 the mouth, nose, and eyes were all involved. In 5 the teeth were absent from the first symptom of the xerostoma, but in 1 the teeth were well preserved.

After the mouth dryness in a severe form has once been inaugurated, it practically remains as long as the patient lives, but it seems to reach its maximum intensity within a short time and then remains with but little or no change for an indefinite period. The duration of the affection is therefore long and indefinite and appears to have

but little tendency toward shortening life, as in my case it has existed for over six years. In a case seen by Lartigau, in a man of sixty-four years, the affection appeared a few weeks after his wife had suffered a tragic death. The salivary glands were normal in size, taste was diminished, perspiration had decreased after the salivary secretion had disappeared, and treatment was absolutely ineffective; while three and a half years after the case was first seen the condition had undergone no change and the mucous membrane of the mouth and pharynx was extremely dry, so that considerable discomfort was caused in swallowing.

While an occasional case has been reported in which local or constitutional remedies have for short periods apparently been of some benefit in temporarily relieving the xerostoma, yet such relief was of short duration and ultimately failure along therapeutic lines seems to be the inevitable result. This is shown in a case seen by Robinson and reported by Chappell, of a woman with xerostoma following *la grippe*. There was pain in the roof of the mouth to one side of the median line, so that at night she was obliged to place a piece of paper against the painful spot in order to prevent contact with the tongue, which rendered the pain much worse. She had to drink water frequently at night to relieve the buccal dryness, but the urine was normal. Chlorate of potash and strophanthus made the dryness worse, while oil of wintergreen in olive oil applied locally gave temporary relief. At a still later period, after a number of remedies had been used, she was slowly growing worse in spite of all treatment.

Galvanism and pilocarpine have seemed to give the best temporary results in the majority of cases, while for the constant dryness of the mucosa of the upper respiratory tract aqueous or oily solutions containing various medicinal substances may be employed. With pilocarpine the best results—and even these are but transient—have been obtained by allowing the patient to dissolve $\frac{1}{8}$ to $\frac{1}{20}$ grain on the tongue, especially at bed-time; or he may employ it more frequently in the same manner in doses of $\frac{1}{100}$ to $\frac{1}{200}$ grain. Potassium iodide, glycerin, chamomile, and a host of internal and local remedies have been employed with little or no benefit; while Shurly obtained some effects from chloride of sodium held in the mouth and bismuth boroglyceride applied to the mucosa by a brush. The same author states that acacia, tragacanth, and balsam of Peru are occasionally useful; while internally strychnine, fluid extract piscidia erythrina, and tincture chamomile may also be employed.

CLINICAL INVESTIGATIONS OF THE DIGESTION IN THE INSANE:

A CONTRIBUTION TO THE STUDY OF THE NEUROSES OF THE STOMACH, WITH SPECIAL REFERENCE TO HYPERACIDITY AND BITS OF MUCOSA FOUND IN THE STOMACH WASHINGS.

By David Murray Cowie, M.D.,
ANN ARBOR, MICH.,

AND

Florence Allen Inch, M.D.,
KALAMAZOO, MICH.

The following pages record the results of a series of investigations upon the work of the digestive glands in the insane conducted at the Michigan Asylum for the Insane at Kalamazoo, Dr. William M. Edwards, Medical Superintendent. The work was begun in the spring of 1900. A short and very incomplete report of the earliest part was published in the *Proceedings of the Michigan State Medical Society* of 1900, and the *Physician and Surgeon* of the same year. Because of other pressing duties, it was impossible for us to devote our time exclusively to this study, accordingly a number of the reports are not as complete as we would wish and the work has been drawn out over a considerable length of time. This extension of time, however, has been of distinct advantage in a few instances, as it has enabled us to gain a better idea of the more or less constant condition of the secretions of the gastric glands.

The suggestion for our work was received from von Noorden's article, "Stitungsbericht der medicin Gesellschaft zu Giessen," published in the *Archiv für Psychiatrie und Nervenkrankheiten*, Band xvii., 1887. As a somewhat careful search through the literature failed to disclose any verification of von Noorden's work, we came to the conclusion that should we attempt to duplicate his researches so far as possible for purpose of comparison, we would not be forcing an entirely unnecessary investigation upon the medical journal and its readers. It would be difficult to improve upon the manner in which von Noorden conducted his researches; our report differs from his in only a few details, and these we will indicate as we go along.

It goes without saying that the neuroses of the stomach are encountered more frequently than any other group of stomach diseases, at least in America. Indeed, it is to be questioned whether we do not encounter an associated neurosis of some kind in a large percentage of the true organic diseases of the stomach, such as chronic gastritis, peptic ulcer, and dilatation. It is impossible to multiply too many facts concerning the neuroses, and we trust that

others will take up the work where we have left off, improve upon it, and investigate the condition of the stomach functions in other mental states. Work of this character can be carried on much better by someone who resides at an asylum, where his patients are constantly under his control and observation. The asylums owe a debt to the profession in this particular. Cases should be studied more carefully than we have been permitted to do. The relation of appetite to the secretions, the effect of changing mental states upon the secretions and functions, the postmortem findings, and especially the study of the gastric mucosa—which has been preserved by filling the stomach with formalin solution immediately after death—should be investigated. The mucosa in particular offers a promising field for research. In no other field of medicine is there such a dearth of pathological knowledge as in insanity. Lastly and very important is the psychological study of these peculiar phenomena of digestion. This we do not attempt, but leave it for those who, by special training, are better fitted for this task.

The writers are greatly indebted to Dr. William M. Edwards, Medical Superintendent of the asylum, for placing at their disposal the patients and laboratories of the institution. To Drs. Inch and Barrett, as well as to Dr. Cowie's former assistant, Dr. Ralston Williams, acknowledgment is also due for valuable services.

HISTORICAL. *A Brief Résumé of the Investigations that have Been Made on the Secretions in the Insane.* So far as the subject of this contribution is concerned, the history is a brief one. We have only to go back eighteen years for the older ideas concerning the secretions of the stomach in melancholia. Until this time alienists were content to consider the various gastric symptoms complained of by melancholiacs, and they are many, to be due to a gastric catarrh or nervous dyspepsia, and that the loss of appetite and its consequent symptoms were due to a diminished secretion of the gastric juice. Naturally from such reasoning, hydrochloric acid and pepsin were extensively used in the treatment of these cases.

For some reason von Noorden's work seems to have been overlooked by alienists in general. A perusal of the more popular works on insanity would at least lead one to this conclusion, as no mention is made of this valuable acquisition to medical science. When, on the other hand, we turn our attention to the domain of internal medicine, we find that, particularly in those works devoted more or less exclusively to diseases of the digestive apparatus, von Noorden's researches in this field are well known and frequently quoted.

The study of the urine in the insane has been considerable. Bondurant may be said to be foremost among those who claim that albuminuria is of frequent occurrence in the insane, independent of morbid histological changes in the kidneys. In a large number of these cases the albumin was detected by tests that are far more delicate than those employed in the usual urine examinations, and

it has been claimed that control experiments upon normal urines have not been sufficiently conducted. It is thought by some that the albuminuria in the insane is similar to that which can be induced experimentally. Albumosuria is thought by Pilcz to be of more or less constant occurrence in mania, and peptonuria, glycosuria, and acetonuria are thought by others to have some bearing on the insane state. Just what all these various phenomena mean is certainly thus far by no means comprehensively explained, and little, if any, practical value has been derived therefrom.

The study of the effect of the so-called autointoxications which are brought about by the absorption of ptomaines and leukomaines resultant upon the improper splitting up of albuminous substances in the intestinal canal has received the attention of a number of investigators. Experiments have been conducted, the object of which has been to test the effect of the injection into animals of urine and stomach contents from the insane and from cases of autointoxication. The toxicity of the material injected is thus estimated. Toxic substances in the blood of the insane have been demonstrated by Naegeli and his followers by a reaction which occurs when certain algæ (spiro-gyra) are placed in diluted blood; but little if any importance has been attached to this, as in all disease states more or less toxic substance is being constantly carried in the blood and produces similar reactions. Here, again, we are unable to see what benefit has been derived from the study of these last two considerations. All of these findings may, however, be considered acquisitions to our storehouse of knowledge, and as abstract facts may at some time, like the stone which was set at nought by the builders, become the head of a corner.

To return to our subject. It would seem that alienists would be more interested in this subject than internists, for to them it has not alone a scientific interest, but an eminently practical bearing. In this field, where conditions are so favorable and the work so promising (we refer to all gastric methods), it is remarkable that so little has been done, for, as von Noorden pointed out many years ago, scarcely any other physician is in so favorable a position to study his patients for months and years, under such excellent conditions for observation, as is the physician in the insane asylum.

Von Noorden, in 1887, was the first to conduct a series of experiments which had in view the determining of the effect of states of mental derangement upon the stomach secretions of the insane. The effect of mental attitudes upon certain gastrointestinal phenomena had long been observed in the medical clinics, and it was because of this that von Noorden sought to extend his observations to the field of insanity. He picked as the object of his research cases of melancholia, for the reason that in this mental state the gastric digestion is generally interfered with in the widest sense of the word. He eliminated all distinct diseases of the stomach, such as cancer,

ulcer, and dilatation, and restricted himself to a definite group of cases in the expectation of finding alongside of psychical fancies of a certain type symptoms of a corresponding type.

In his work von Noorden followed Riegel's (1887) scheme for the analysis of the stomach contents. This consisted in the estimation of the total acidity and the qualitative testing for free hydrochloric acid with tropæolin and Congo red paper, for lactic acid with Uffelmann's reagent, and for the peptic power by means of the egg-disk method. The fasting stomach was also examined, and the motor power determined by the amount recovered after an ordinary meal and the condition of the succeeding lavage.

Von Noorden reports in all 14 cases. The results of his investigations are as follows:

The first 12 cases represent states of pure psychical depression, differing from each other only in severity and duration. The first 10 of these correspond in all essential points, namely:

1. The evacuation of the stomach was hastened after the eating of the chief meal, consisting of food of a mixed character.

2. The total acidity reaches its highest percentage value during the process of digestion, as we do not find it in healthy men or only exceptionally so.

3. The strong acidity results entirely or almost entirely from the presence of free HCl, organic acids intrude seldom, and then only in small amounts.

4. The peptic power of the stomach is excellent in the presence of meat. The peptic power of the filtered stomach contents in the presence of the albumin disks is about normal.

5. A continual hypersecretion of the stomach fluids in the sense that at times when the stomach no longer contains food fluid secretion still continues, does not exist.

6. Dilatation of the stomach exists in no case.

Cases XI. and XII. showed what was considered normal secretion, and Cases XIII. and XIV., which had gone into dementia, showed hydrochloric acid secretion lower than normal.

Thus von Noorden overthrew completely the ideas previously held and revolutionized the treatment of stomach symptoms in melancholia, placing it upon a scientific basis. It is to be regretted that others have not extended the work farther and carried on investigations in other mental states.

Order of Our Investigation. For purpose of comparison, we have followed, with but few exceptions, the same order of investigation as did von Noorden. Where we made changes we did so because we thought that better and more constant conditions would be obtained.

The selection of patients was made by asylum physicians, with the approval of Dr. William M. Edwards, Medical Superintendent. Only those cases which showed signs of depression were selected,

and in all these we had sufficient grounds for making the diagnosis of melancholia. Many were in the beginning stages, while others were in a state of transition into secondary forms of insanity. In our routine work we found that many of the patients examined showed more or less severe stomach disease. These we rejected, retaining only those who showed no signs of organic disease, such as cancer, ulcer, and dilatation. We further endeavored to select patients who made no complaint of stomach symptoms. This was difficult to do, because of the great frequency of such symptoms in melancholia. Because of the great frequency with which we meet with enteroptosis among the insane as well as among patients in our internal medicine clinic, it was next to impossible to obtain sufficient women patients for our investigation without including a few of these (Case I. and Case II., Group II.). However, we do not hesitate to present these, for the reason that the stomach secretions in such cases are as likely to be normal as they are to be abnormal. The majority of such individuals have never had their attention drawn to their stomach until a hospital examination has discovered to them that some of their viscera are displaced.

The Test Meals. We chose as the principal test meal for our investigation the Ewald test breakfast or rather its equivalent: 70 gms. of white bread without crust and 300 c.c. of water. This was removed from the stomach one hour after eating. We selected this meal because it is in more general use among gastroenterologists and because we can better compare results with those obtained in the medical clinic. With but few exceptions we determined the effect of Riegel's test dinner and the ordinary asylum dinner upon the functions of the stomach. In this respect our work differs from that of von Noorden, who employed a mixed meal of soup, meat, potatoes, cabbage, turnips, carrots, spinach, etc., of which his patients were fed an amount that probably fell a little below what they would eat in their normal state. This meal was removed at the height of digestion, a time which corresponded in most of his cases to five or six hours after eating.

The majority of our patients took the food unwillingly after much coaxing, a few, however, seemed to eat with relish and manifested some interest in what we were doing. In no case did we have to resort to gavage.

Examination of the Fasting Stomach. This was done to exclude cases of hypersecretion and to assure us that in those cases where the stomach outlines by the distention test indicated a slight degree of dilatation we were in all probability dealing with a megastria and not with a pathological dilatation, and that in those cases where the stomach outline did not extend beyond what is considered normal, there was no pyloric obstruction of any kind.

Chemical Analysis. We employed for the chemical analysis of all stomach fluids Toepfer's method, controlling the hydrochloric

acid test with Gunzberg's reagent and Congo red paper. Lactic acid was tested for by Uffelmann's and Keeling's methods. We are thoroughly familiar with the objections raised to the employment of Toepfer's method, but this is no place to discuss methods; suffice it to say that it has many advantages over the method employed by von Noorden, and that the results obtained may be considered approximately correct. The titrating in each case was almost always made by the same person. This was done to avoid differences that might result from the personal equation. For well-known reasons we considered, however, as the end reaction for the total acidity the appearance of the first permanent pink[1] (not the deep red advised by Toepfer) for free hydrochloric acid, the disappearance of the orange tint.

The peptic value was estimated partly by the egg-disk method and partly by the Mett method. In the latter method the peptic value is expressed by the squares of the millimetres of egg white digested during ten hours' incubation and not by the number of millimetres, as is frequently but incorrectly done. The curdling ferment was tested qualitatively by Leo's method, and starch digestion by Lugol's solution.

Histories. We present a brief history of each case, together with the chemical analysis and other findings. Only those points are given which we think are sufficient to warrant us in deciding that the case is one of depression, as the object of our research is to inquire into the secretions of the stomach in these patients. *The physical examination may be considered negative excepting when otherwise indicated.* With few exceptions, urine, blood, and weight notes are given. These are taken from the asylum records.

Consideration of Cases. We report in all 22 cases and have arranged them into three groups. Group I. contains 16 cases, all of which have shown at some time degrees of hyperacidity. Group II. contains 2 cases, both of which show hyperacidity, but, because of certain findings, such as fragments of mucosa, it was thought best to consider them separately. Group III. contains 4 cases showing normal secretions and achlorhydria.

Group I.

In this group there are 8 females and 8 males as follows:

Case I.—Emma G. (see Table I.), aged sixty-one years, married, American, washerwoman, common school education; two children dead. Mother was insane latter years of her life. The patient had pneumonia nine years ago. Since this time her health has been very poor. She has overworked and has had much family trouble. Insanity began in the spring of 1899 with depression, gradually developing

[1] The standardizing of our decinormal soda solution was done by titrating to the same color.

into delusions of impending harm. Six months before entering the asylum she had an ovarian cyst removed.

The patient was admitted to Michigan Asylum for the Insane May 1, 1900. She was profoundly depressed. She would not speak and sighed almost constantly. She soon became agitated, moaned, and at times cried loudly. She was restless and frightened at everything. There has been little improvement during her residence at the asylum. She has suicidal tendencies, threatens to drown herself, but has made no suicidal attempts. She refuses to eat and has to be fed. She will not talk, except occasionally a few fragmentary words. She sits in one place all day with her eyes upon the floor. She escaped once from the asylum in her night-clothes. She has never complained of her stomach. Her appetite is poor and she does not sleep well.

Physical Examination. The patient is of slender frame, 154 cm. high. The musculature is small and wasted. The skin is sallow and anæmic. The tongue is pale, moist, swollen, and has a white coating all over. Her memory is impaired temporarily, indication is weak and mentalization is slow.

Heart: Soft blowing systolic murmur at apex, otherwise the heart is negative. Pulse, negative.

The abdomen is below the level of the ribs. There is slight bulging just below the umbilicus and a laparotomy scar. The abdomen is easy to palpate. There is no succussion in the stomach. On distending the stomach with air, the greater curvature is seen two and a half inches below the umbilicus, the lesser curvature at the umbilicus.

Pelvis: Slight laceration of cervix. Uterus is retroverted.

Blood: Red cells, 4,800,000; hæmoglobin, 72 per cent.; white cells, 3820.

Urine: Negative on all occasions.

The stomach secretions in this case were observed, as will be seen from the accompanying table, from May, 1900, to December, 1902. For eight months at the times when Ewald test meals were given, there was always, with but one exception, a distinct hyperchlorhydria.

Case II.—Clara H. (see Table II.), aged sixty-eight years, married, American, housewife; three children; common school education. Her father was insane. The patient was always quiet and reserved in her manner until three months previous to her entrance to the asylum. At this time she began to be more talkative and apprehensive. She had delusions that her family were going to lose their property and that she was going to be killed; that she was possessed of a devil and that brimstone was coming out of her. She attempted suicide by cutting her throat.

The patient was admitted to the Michigan Asylum for the Insane in January, 1902. She was profoundly depressed and was sus-

picious of everything. As a rule, she would not talk. She worried much, and occasionally said that she was wicked. At times she became very restless and much agitated. Her appetite was irregular, sometimes very good; at other times she refused to eat. Her bowels were constipated. She did not complain of her stomach. May 24, 1902, she was less depressed than when she entered.

Physical Examination. The patient is fairly well nourished.

Abdomen: The abdomen is flat and below the level of the ribs. The panniculus is thin. The kidneys and spleen cannot be felt. Palpation is negative. It is almost impossible to find out more about her abdomen. She absolutely refuses and resists food and stomach tube. There is no evidence that her stomach is dilated or prolapsed.

Blood: Red cells, 4,000,000; hæmoglobin, 75 per cent.; white cells, 9772.

Urine: There is a trace of albumin, a few hyaline casts.

Weights: July 22, 1902, 83¾ pounds; May 31st, 94½ pounds; August 31st, 97½ pounds.

Case III.—Lizzie W. (see Table III.), aged thirty-nine years, married, American, housewife. Family history negative. Syphilis suspected. Three months before admission to asylum she began to have delusions and was quite hypochondriacal. She was very irritable and at times became agitated. She thought her husband was going to murder her and she grew violent.

Patient was admitted to asylum February 9, 1901, in an extremely confused condition. She had delusions of persecution. Three days later she had one or two epileptiform attacks, later she grew noisy, and in the following July had a paretic stroke. She recovered from this and continued in her delusion that someone was trying to kill her. She refused to eat at times because, as she said, she knew the food contained poison. December 19th she was removed somewhat improved. January 2, 1902, she was returned in the same condition as before. She now had delusions that her clothes were filled with snakes. She was much depressed, crying much of the time. She died June 2, 1902, after a convulsion. No stomach complaints.

Abdomen, negative; stomach in normal position.

Gynecological Examination. Labia minora hypertrophied, laceration of cervix. Urine, negative.

Stomach observations were made at intervals from February, 1901, to July, 1902. During eleven months at the times when examinations were made a distinct hyperchlorhydria was found after the Ewald meal.

Case IV.—Mary L. B. (see Table IV.), aged forty-eight years, single, American, housewife. One uncle insane. One aunt committed suicide. The patient has always been peculiar, easily excited, and easily irritated. In August, 1900, she began to show signs of insanity. She was much depressed. In February, 1901, she took

carbolic acid into her mouth, incurring some burns on her lips and tongue. She believed herself to be a great sinner and that she would never be saved. Her appetite was poor and she did not sleep well. She said her stomach never troubled her.

The patient was admitted to the Michigan Asylum for the Insane February 16, 1901. She was decidedly agitated and showed hysterical and suicidal tendencies. Her wickedness gave her much concern, and she would not be moved from the idea that she had ruined and disgraced her family. She showed suicidal tendencies. During her residence at the asylum her appetite improved and she slept better. Her mental condition, on the other hand, did not improve. She grew more restless and agitated, would not stay in bed and picked at her hands and face. She committed suicide by hanging.

Physical Examination. The patient is poorly nourished and looks somewhat emaciated.

Examination of Blood: Red cells, 4,000,000; hæmoglobin, 98 per cent.; white cells, 6663.

Urine: Negative.

Stools: Somewhat constipated.

Weight on admission, 103¼ pounds.

There has been practically no change in weight during her residence.

Case V.—Hannah B. (see Table V.), aged fifty-seven years, married, American, housewife. One daughter insane. First signs of mental derangement began in October, 1899, supposedly due to worry over the death of her sister. She became melancholy, thought someone was watching her and was trying to take her away. She showed suicidal tendencies; indeed, she attempted to take her life by jumping into a well.

The patient was admitted to the Michigan Asylum for the Insane January 28, 1900. She is much depressed. She complains of her stomach being sour and a feeling of heaviness in the epigastrium. Her appetite is poor. During her residence at the asylum she steadily gained in physical and mental strength and was discharged January 1, 1901, cheerful and apparently free from depression. She was readmitted April 7, 1902, and at the same time her daughter was admitted. She remained quite well until recently, when she became irritable, obstinate, and emotional. She has worried over her daughter and is quite depressed. She attempted suicide by refusing to be removed from the railroad track. She continues to complain of her stomach. Her food comes up into her mouth; it is sour and produces a burning sensation in the tongue. She says that she has raised blood, bright red in color; it has a disagreeable taste and occurs in the morning and sometimes during the night. She does not know where it comes from. She vomits occasionally. She coughs considerably, but has not raised any sputum. She is constipated, and her appetite is poor.

Physical Examination. Patient is slightly emaciated, average-sized skeleton, skin is sallow; panniculus is thin; mucous membranes are pale. Tongue swollen, flabby, pale, coated white. Teeth are good.

Lungs: Thorax is long, broad, but shallow. Expansion is fair and symmetrical. Percussion is negative. On auscultation there are distinct crackling rales on the right side over the first and second ribs near the sternum; otherwise examination of the lungs is negative.

Heart: Apex inside nipple, fifth interspace costal. Heart dulness not increased. Heart sounds are weak. There is a very soft, faint, blowing, systolic murmur at the apex.

Abdomen: The abdomen is on a level with the ribs; the walls are very flabby; the panniculus is thin. There is tenderness on pressure over the epigastrium. Liver, spleen, and kidneys negative. Stomach negative.

Blood: Red cells, 4,000,000; hæmoglobin, 80 per cent.; white cells, 3552. Later red cells, 4,800,000; hæmoglobin, 77 per cent.; white cells, 8240.

Urine: No albumin, very few hyaline casts.

Weights: April 7, 1902, 131 pounds; June 30th, 131 pounds; July 31st, 134¼ pounds.

While there are some symptoms of ulcer in this case, our observation has led us to believe it does not exist, and that these symptoms are not sufficient to rule the case out.

Case VI.—Olivia B. (see Table VI.), aged thirty-five years, single, American, dressmaker, common-school education. Mother is insane. The patient has always been well, of a kind and quiet disposition, fond of company and industrious. She has worked very hard and has eaten little. In March, 1902, she became insane; she had delusions that men on the street were pointing their fingers at her and making fun of her, that her customers did not care for her work any more, that she had done something wrong and that the people would not forgive her. She refused to eat because she thought the food contained poison.

The patient was admitted to the Michigan Asylum for the Insane April 7, 1902. She was depressed; she talked freely, however, and wondered why she was brought to the asylum. She is much confused and cannot reason; she keeps asking the same question over and over. She worries much over something she has done that cannot be forgiven. She is suspicious, cries much, and fears that something dreadful will be done to her. She has shown no suicidal tendencies as yet. Her sleep is disturbed. Her appetite is variable. She never complains of her stomach. Her bowels are constipated.

Physical Examination. The patient is well nourished and strong. Mucous membranes are slightly pale.

Heart: Apex fifth intercostal space, inside the nipple line. The heart dulness is not increased. There is a loud blowing systolic murmur at the apex transmitted into the axilla.

Blood: Red cells, 4,000,000; hæmoglobin, 75 per cent.; white cells, 5584.

Urine: Negative.

Weights: April 7, 1902, 109 pounds; May 31st, 109 pounds; August 31st, 111¼ pounds.

CASE VII.—Helen C. (see Table VII.), aged twenty-four years, single, American, schoolteacher. Paternal grandfather was insane, maternal grandmother died from some cord disease; father and mother both very nervous.

Patient is a college graduate, and was considered a bright student. She taught school one and a half years. Her career as a teacher was unsuccessful, and her work soon became distasteful to her. She became very nervous, and soon lost all control of herself. She would walk up and down her room, wring her hands, and talk in a confused manner.

Insomnia developed, and she became more depressed with the delusion that she had failed to seize opportunities for bettering herself and family, and for this reason they were coming to want.

Patient was admitted to the asylum February 25, 1902, in an extremely restless condition. She would run from one room to another, moaning and crying. She slept but little. Her appetite was variable. The following December she showed inclination to become violent by striking her fellow-patients. She left the asylum January 29, 1903. Since that time she was operated on for removal of the clitoris. She improved for a time, but is now quite nervous.

Physical examination at the time of her admission was negative, with the exception of a systolic murmur at the aortic and pulmonary areas and a somewhat anæmic appearance.

The abdomen is negative, stomach in normal position.

Gynecological Examination. Slight hypertrophy of labia minora and clitoris.

Blood: Red cells, 4,000,000; hæmoglobin, 58 per cent.; white cells, 1400.

Urine: Negative.

June, 1904, patient perfectly well and has been for some months.

CASE VIII.—Anna R. (see Table VIII.), aged fifty years, married, German, housewife. Admitted to asylum June 26, 1900. No insanity in family. About the time of the menopause (1898) she became depressed and agitated, worried much because she thought she had killed her son. Later on she became very incoherent and extremely restless; she walked the floor almost incessantly night and day, crying and moaning. She is very untidy in her general appearance and habits. She has hallucinations of hearing, delu-

sions of depression, ideas of persecution. Sensations are painful. Psychomotor processes decreased.

Her bowels are constipated; she complains of her food coming up in her mouth; she vomits occasionally. Her appetite at first voracious; later on became poor. She gained in weight at first, then lost. During her stay in the asylum, over one year, her depressive delusions did not abate; she constantly worried over imaginary troubles. She died December, 1901, after laparotomy (anterior fixation and perineorrhaphy).

Patient is fairly well nourished, and abdomen negative.

Blood: Red cells, 4,000,000; white cells, 4774; hæmoglobin, 85 per cent.

Urine: No albumin, but a slight excess of leukocytes; otherwise negative.

Weights: June 26, 1900, 95 pounds; June 30, 1901, 118½ pounds; November 30th, 128 pounds.

Postmortem was permitted, but only to ascertain condition of the pelvis. Stomach was not examined.

Case IX.—Hugo A. (see Table IX.), aged thirty years, single, German, factory hand. Family and personal history unknown.

The patient's conduct until within ten days of his admission to the asylum was not observed to be particularly out of the ordinary. He was admitted October 10, 1902, when he became suddenly violent and maniacal. This mental state was very soon followed by depression and agitation. He became anxious about himself and worried much. He has delusions regarding his digestive organs, thinks they are displaced. He begs for an operation to replace them. His general appearance is that of depression. He becomes agitated at times. Has made no suicidal attempts. His appetite is good and his bowels normal. This state of depression continued over one month prior to our investigation of his case and still remains so.

Blood: Red cells, 5,240,000; white cells, 3424; hæmoglobin, 72 per cent.

Urine: Negative.

Weights: October 10, 1902, 144 pounds; 17th, 153 pounds; 24th, 149 pounds; December 4th, 144 pounds.

Case X.—Frank W. C. (see Table X.), aged thirty-four years, married, American. Maternal uncle was insane. Patient had always been a man of good habits until his mental derangement began a few weeks before his admission. During this time he had been acting peculiarly, and on November 24, 1902, he developed the idea that people were following him for the purpose of killing him. He entered a hardware store for the purpose of purchasing a revolver, but was taken into custody.

Patient was admitted to the asylum November 27, 1902, with marked hallucinations of hearing. He was very suspicious of those

about him, fearful of injury, and thought he would be mutilated in some way before he would be allowed to leave the asylum.

He became very restless and confused mentally. He showed some signs of improvement and was discharged January 14, 1903. It was necessary to readmit him a few days later because of increasing delusions and hallucinations. He was much depressed, cried much, thought his wife was unfaithful. A few days later he again showed signs of considerable improvement and was discharged.

Physical examination shows apex beat slightly displaced to the left. There was slight roughening of the first sound at the apex.

Urine: Small amount of albumin, excessive leukocytes.

Blood: Red cells, 5,240,000; white cells, 6472.

CASE XI.—Hugh L. (see Table XI.), aged thirty-eight years, married, American. Family history negative. In May, 1902, patient developed peculiar ideas. Thought people were trying to injure his reputation and do him harm. He became restless and sleepless, and his appetite became capricious. The following November he attempted suicide twice. Tried to drown himself.

Patient was admitted to the asylum November 10, 1902. He thought he had done a great wrong to many people. That he had lost all his property and that his friends had deserted him. He was much depressed and felt that he was unfit to live. He refused food because he thought it was needed for someone else. In a few weeks he showed signs of improvement. His delusions grew less, and in the following May, 1903, he was discharged as recovered.

Patient was readmitted in October, 1903, having again become incoherent in his conversation and mentally confused. He was depressed and emotional. He showed improvement again, and was discharged February 6, 1904, practically improved.

Urine: Negative.

Blood: No report.

CASE XII.—George K. (see Table XII.), aged twenty-three years, single, American, teacher. No insanity in family. Personal history negative. In March, 1902, patient began to show signs of mental derangement. He became irritable and sleepless. He worried much about his bad habits, and thought his illness due to his meanness. He endeavored to avoid seeing people, preferring to be quiet. Thought people were watching him and would hide himself under the barn for hours. He was admitted to the asylum October 2, 1902, depressed and delusional. Believes he has been very wicked and that he is unworthy, begs to go home, so that he can ask forgiveness of everyone.

Abdomen just below the level of ribs, symmetrical. Palpation, etc., negative. On distending stomach with air, the greater curvature is found two fingers above the umbilicus.

Blood: Red cells, 6,000,000; hæmoglobin, 75 per cent.; white cells, 4569.

Urine: Negative.

Weights: October 1, 1902, 160 pounds; November 1st, 173 pounds; December 1st, 176 pounds.

CASE XIII.—Frank K. (see Table XIII.) aged thirty-eight years, married, Austrian, varnisher. Family and personal history unknown. June, 1902, he became depressed, moody, restless, and irritable. He was admitted to the asylum July 14, 1902, decidedly depressed, quiet, and unconcerned by what transpired about him. His sleep is poor; he has hallucinations of hearing and passes much of his time crying and sorrowing. His appetite is poor but he has no complaints concerning his digestion. His bowels are constipated.

Abdomen is on a level with the ribs. The stomach is in normal position.

Blood: Red cells, 4,300,000; hæmoglobin, 85 per cent.; white cells, 2284.

Urine: Negative.

Weights: July 15, 1902, 143 pounds; 30th, 145 pounds; August 13th, 149 pounds; December 4th, 151 pounds.

CASE XIV.—Herman O. (see Table XIV.), aged twenty-four years, single, American, medical student. There is no history of insanity in the family. The patient has always been well and of more than ordinary mental ability. He showed no signs of mental derangement until December 3, 1900; at this date he purchased some arsenic and opium with the intention of committing suicide. For two years previous to this he worried much and complained of his stomach. It is thought that he applied himself too closely to his studies.

Patient was admitted to the asylum December 7, 1900. He was much depressed, introspective, and moody, and decidedly hypochondriacal. He has marked delusions concerning his stomach; he complains of distress in the stomach, but his complaints are vague and unsatisfactory. The bowels are normal.

Blood: Red cells, 3,000,000; hæmoglobin, 90 per cent.; white cells, 5204.

Urine: Negative.

Weight: December 2, 1902, 154 pounds. We were unable to find other weights.

CASE XV.—George E. B. (see Table XV.), aged fifty-five years, married, American, farmer. Nothing known of family history. Patient had always been healthy until his insanity began in the spring of 1902. At this time he became greatly depressed, worried over small matters. He complained of his stomach, and it is thought by members of his family that when his stomach symptoms became aggravated his depression increased. About one month after the onset of his mental derangement he attempted to poison himself. His condition improved, however, in the course of a few months, but he soon returned to his state of depression, attempting to kill himself several times by hanging. His only delusion has been that

he considers it his duty to kill himself because of his unworthiness. At times he is agitated.

Urine: Negative.

Blood: Red cells, 4,860,000; white cells, 9265; hæmoglobin, 90 to 100 per cent.

Weights: December 10, 1902, 155 pounds; 17th, 157 pounds; 24th, 155 pounds; 31st, 155 pounds.

Case XVI.—John V. (see Table XVI.), aged forty-five years, married, Hollander, common-school education. His mother was insane for a short time; otherwise family history is negative. Patient has always been a man of good habits. He was insane four weeks prior to his admission to the asylum, December 8, 1900. He began to act peculiarly, and for a time refused to speak; soon after this he became suddenly elated, yelling and whistling and making unusual disturbance. He did not sleep and talked incoherently. When admitted he was in a state of acute mania, which continued for four months, during which time he gained in weight and general bodily nutrition. In March, 1901, he began to be depressed. He sat around the ward worrying about himself and his family, and continued in this condition for eight months, when he was discharged as improved. When first deranged he had a voracious appetite, but later he became irregular about his eating.

Urine: Negative.

Blood examination was not made.

Weights: December 17, 1902, 146 pounds; January 10, 1903, 135 pounds; October, 146 pounds.

Discussion. The results of the preceding examinations may be summed up as follows:

1. The evacuation of the stomach after the test breakfast is hastened in 1 case, normal in 6 cases, and somewhat delayed in 9 cases. After the Riegel or ordinary asylum meal the evacuation is hastened in 8 cases, normal in 1 case, and delayed in 3 cases. The remaining 4 cases received no large test meal. We may say in general that after a small stimulus, such as that received by the Ewald test breakfast, the evacuation of the stomach is usually normal or somewhat hastened; while after the large stimulus of the Riegel and ordinary asylum meal it is more frequently hastened.

2. The free hydrochloric acid value ranges from 60 to 90 per cent. in 12 cases, from 50 to 58 per cent. in 4 cases. These may all be justly called cases of hyperchlorhydria.

3. The total acidity ranges from 90 to 111 per cent. in 10 cases, from 73 to 88 per cent. in 6 cases. It is always above what is usually accepted as normal. They may all be classed as cases of hyperacidity, according to the method of Riegel as employed in 1887, and they accordingly correspond to those reported by von Noorden.

4. The peptic value is up to normal in all cases, often somewhat

increased. The latter condition is especially noticeable in those cases where Mett's method was employed.

5. Hypersecretion is present in no cases.

6. Lactic acid and signs of fermentation are never encountered.

7. The hyperacidity may be said to be constant in most cases, as it persisted for a few months, and in a few cases for many months. The question of the constancy of the secretions was raised by von Noorden, as his cases were observed only over a short period.

8. Retention and dilatation exist in no case. Case I. shows a distinct gastroptosis.

9. Fragments of mucosa were found only in 1 case; unfortunately this was lost and its character is not known. It was a small superficial piece.

10. Stomach symptoms were complained of in 4 cases, Cases V., VIII., XIV., and XV. In Case V. the symptoms were those of hyperacidity.

11. Mucus was not excessive in 13 cases. Slight excess was noted in 3.

12. Males and females equally affected. Von Noorden's observations were upon women only.

EXPLANATIONS. (Ad. I.) It is impossible to fix a definite line for the normal amount of residue after any meal. This has to be left to the judgment of the practised eye. If we find only a few c.c. on an empty stomach three or four hours after an ordinary dinner or a Riegel meal, we say that the evacuation is increased. If we find 50 or 60 c.c., or possibly a little more, we say that the evacuation is about normal. If, on the other hand, we find that 100 c.c. or over are present, we say that the evacuation is delayed. The amount is estimated by what is recovered before and after the lavage. A somewhat extended experience in the University Hospital and in private practice had led to the belief that the majority of so-called normal stomachs contain some food as long as five hours after the ordinary mid-day meal, which is the heavy meal of the day in this locality.

(Ad. II.) The question of normal acidity values is also a perplexing one. The stomach is capable of very wide daily variations. But if we take, for instance, the average figures of Riegel for normal free HCl secretion, 20 to 40 per cent., and consider 50 to 70 per cent. moderate increased secretion, and 71 to 100 per cent. high secretion, then the large majority of our cases are confined to the middle group. Von Noorden did not touch upon this point, as he made no direct estimations of free HCl.

(Ad. III.) We may here compare our results with those of von Noorden, and to do this we must use his figures. He arranged three groups of acidity values; from 0.24 to 0.29 per cent., or, according to the Ewald notation, from 66 to 80 per cent. slight secretion. From 0.30 to 0.39 per cent., or, according to the Ewald notation, 80 to 100

per cent., medium secretion. From 0.40 to 0.50 per cent., or, according to the Ewald notation, 100 to 115 per cent. and higher, highest degrees of secretion. The majority of our cases occupy the middle group; they rarely intrude upon the third group, but in a few instances are found to occupy a position in the upper part of the first group. It will be seen that the variations in some cases are quite great. In all of these respects our observations are remarkably parallel with those of von Noorden, with the exception that our stimulus was less. The total acidity is in all cases above the generally accepted 70 per cent. as the beginning of hyperacidity after an Ewald meal.

(Ad. IV. to X.) These points require no further explanation than will be found under "Order of Investigation."

(Ad. XI.) The amount of mucus was estimated by inspection with the aid of a glass rod or the fingers. The saliva was prevented as far as possible from getting into the stomach contents. Excess of mucus was noted when ropy strings were present.

Group II.

Case I.—Frank S. (see Table XVII.), aged fifty years, single, American, cabinetmaker. One sister mentally deranged. No other history of insanity in family. Patient has always had good health. He was of a cheerful temperament, led a moral life, and was above the average in mental ability. He was of an inventive turn of mind, and his mental derangement is attributed to disappointment over the failure of some of his inventions. Insanity first manifested itself by the gradual oncoming of depression and melancholy. He became sleepless. His appetite became poor, and his general health began to fail. He complained of constipation and loss of weight.

Admitted to the asylum January 3, 1901, six months after the first signs of mental change. He was very quiet, downcast, and spoke only in a whisper. He had delusions which were mostly somatic. He made no definite complaints concerning his stomach, except that at times there was a feeling of distention. He attributed his condition, however, to something wrong with his bowels and insisted that this could never be improved. He had a delusion that his stomach was made of some hard material, that his food was not digested, and that nothing ever passed his bowels. He manifested suicidal tendencies, professing that if he "had the nerve" he would kill himself. Attempted suicide once by hanging. His bowels are constipated. He constantly worries.

Patient is somewhat undernourished.

The abdominal walls are flabby. The panniculus is thick. When distended with air the greater curvature of the stomach is seen to be just at the umbilicus. Otherwise the abdomen is negative.

Blood: Red cells, 4,800,000; hæmoglobin, 75 per cent.; white cells, 4061.

Urine: Negative.

Weights: July 1, 1902, 164 pounds; May 28th, 168 pounds; July 23d, 165 pounds; September 11th, 157 pounds.

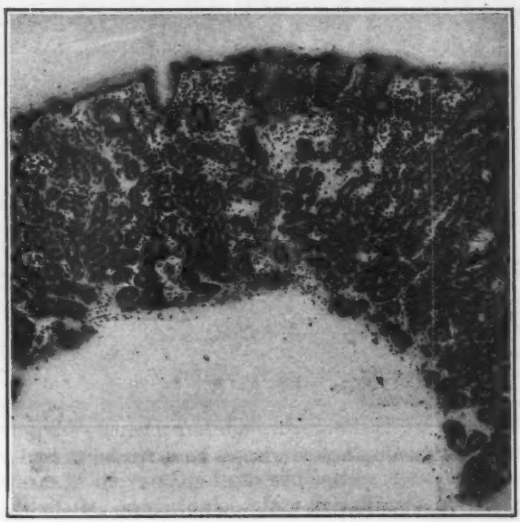
This patient was under observation for fifteen months. Hyperchlorhydria was present practically during all this period.

Dr. Warthin's report on the fragment of mucosa found in the eye of the stomach tube April 20, 1901.

Portion of gastric mucosa cut obliquely; entire mucosa atrophic; excessive mucous formation; majority of gland cells show some mucin; few acid cells; no lymphoid tissue; slight increase of interstitial tissue; slight small-celled infiltration of the upper portion of the mucosa.

Pathological Diagnosis. Early stage of atrophic catarrhal gastritis. (See Fig. 1.)

FIG. 1



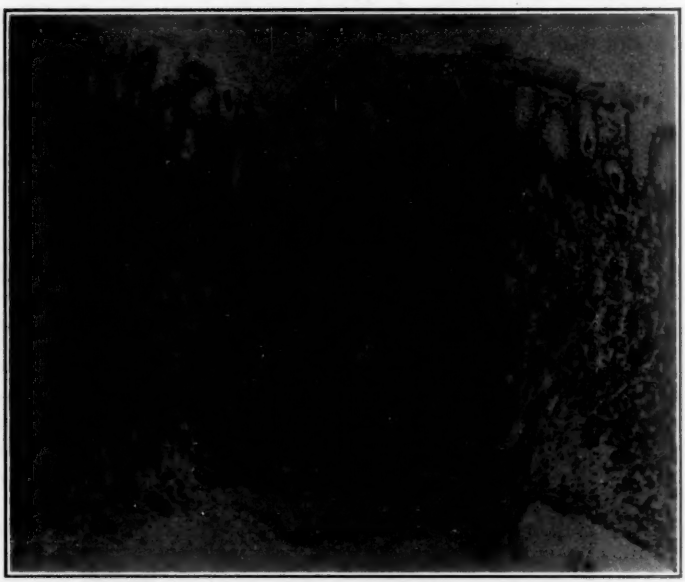
Frank S. Section from bit of mucosa found, April 20, 1901.

CASE II.—Martha Y. (see Table XVIII.), aged fifty-six years, married, American, housewife. Patient has three children and has been above the average in mental ability. One brother committed suicide; otherwise family history is negative. Insanity began three weeks before admission to the asylum in September, 1899. It was thought to be due to the menopause. She began to write letters to

various people stating that she had sinned against the Holy Ghost and that her wickedness could never be forgiven. She imagined that she had ruined her family and that she robbed her husband of $75,000. She had hallucinations of impending harm to herself and children; also hallucinations of taste and hearing. It was not long before she became somewhat agitated. She is extremely depressed.

After eight months' stay in the asylum she had improved slightly, was discharged, but was returned in a few weeks in the same condition as before. She has threatened suicide frequently. She has

FIG. 2



Martha Y. Section from bit of mucosa found, February 26, 1901.

had a delusion that her bowels have not moved for six months. June 1901, attempted hanging. She constantly brooded over her wickedness.

Patient's appetite has always been good; she constantly laments because she feels inclined to eat too much, but at no time has she complained of symptoms referable to her stomach. Says that she has no stomach.

Patient is well developed. Panniculus is quite thick. The abdomen is level with the ribs, walls are firm, making palpation difficult. No tenderness at any point. Examination is negative.

Stomach: The lesser curvature is one and a half fingers above the umbilicus, greater curvature two and a half to three fingers below.

Gynecological examination shows cystocele, rectocele, slight perineal laceration.

Blood: Red cells, 3,550,000; white cells, 4800; hæmoglobin, 75 per cent.

Urine: Negative.

Note August 5, 1902. Patient has deteriorated in physical health. When she entered the asylum she weighed 152 pounds, now 99 pounds. Since her admission she has had an attack of diarrhœa, and during the epidemic of smallpox in the institution in 1901 she was one of the most severely attacked. These two conditions are responsible for her loss in weight. There is no evidence of malignant disease.

Patient died after laparotomy. No autopsy could be obtained. The abdomen was, however, opened and the stomach was found to be of normal size and free from any new-growth or ulceration. The patient had been under observation for eighteen months, during fifteen of which hyperchlorhydria was always present after an Ewald meal.

Dr. Warthin's report. Fragment found February 27, 1900.

Bit of mucosa extending in places to the basement membrane, portions of which are present; mucosa is atrophic, less than two-thirds normal thickness; no lymph follicles present; very few acid cells; capillaries conjested; no increase of interstitial tissue; no excessive mucus formation.

Diagnosis: Simple atrophy. (See Fig. 2.)

Discussion. A careful consideration of both of the cases in this group shows that, aside from the finding of fragments of mucous membrane in the stomach contents, they correspond exactly with those of the first group. These bits of mucosa were placed almost immediately into 95 per cent. alcohol, and because of the appearance of fresh blood, their shape, and relation to the tube, there can be no question but that they were torn from the mucosa during the process of emptying the stomach and the withdrawal of the tube. They may therefore be looked upon as representing the true conditions going on in the area of the mucosa from which they came, uninfluenced by any action of the gastric juice after detachment from their blood supply.

In both cases there is evidence of atrophic change. In Case I. the atrophy is more noticeably associated with a progressive gastritis or degeneration; while in Case II. there is no excessive mucous formation, but the change is distinctly one of simple degeneration or atrophy of the glandular elements, resulting in a thinning of the entire mucosa. It is true that we are here dealing with a very limited portion of the mucosa only, and that we can make no positive statement of what is taking place in the mucosa beyond this limited area.

However, there is every reason to believe that the changes are at least going on in a more or less circumscribed area larger than the fragments found in the washings, for in the latter case pieces of mucosa were found on three different occasions, the last piece being found three months after the second, and in all similar changes are seen. Further, the pathological change is more or less evenly distributed throughout the sections. It may, therefore, be assumed that there are other areas of the same nature scattered throughout the mucosa. This being the case, there would be reason to believe that with such a change, resulting in compression and degeneration of the glandular elements, the secretions, under ordinary circumstances, would be lessened. The question that naturally follows is, What is the cause of the apparent oversecretion or hyperacidity?

In answer to this question, three theories may be advanced:

1. That at some time the patients have had a much higher hydrochloric acid secretion and that the present more or less constant secretion is due to progressive anatomical changes.

2. That the remaining intact glands are doing compensatory service.

3. That the increased secretion is due to the influence of the neurosis or psychosis.

Knowing that the stomach glands are capable under normal circumstances of performing unlimited service according to the demands made upon them, as is shown, for instance, in the greater secretion after an albuminous meal than after a meal made up principally of carbohydrates, and in view of the fact demonstrated by von Noorden and ourselves that hyperacidity is present in a large percentage of cases of mental depression, we are inclined to the third opinion and think it is not unreasonable to expect that, in spite of the progressive anatomical change, the neurosis or psychosis is responsible for the increased secretion.[1]

Group III.

This group contains the remaining cases of our series. Cases that were selected in the same way as those that have gone before. They do not meet the requirements set by von Noorden in order to be considered cases of hyperacidity. Cases I. and II. have, however, fairly high hydrochloric acid values at times. Cases III. and IV. are practically cases of the so-called achylia.

Case I.—Arthur P. (see Table XIX.), aged forty-three years, married, American. Little known of family history, except that he

[1] Hemmeter reports twelve cases of anacidity and subacidity in which fragments of mucosa were found. Proliferation of the glands was present in one case with well-marked round-celled infiltration.

was always weak-minded, a bar-room lounger, and a rough fellow in general. Six months prior to his admission to the asylum he threatened to assault his father with an axe. He wandered from place to place.

Patient was admitted to the asylum March 1, 1893. He was easy to manage, observed the rules of the institution well and had no idea of his mental condition. The following June he developed fault-finding and whining, frequently showing a mean disposition, annoying other patients. March 19, 1894, showed much excitement; thought he was going to die; that his heart was moved from its normal place and that it was bleeding. He became confused and thought that there was something inside of him that migrated with regularity from his breast bone to his rectum. September 22, 1896, these hallucinations were still present, and he was if anything more depresed than before. In March, 1901, complained of various animals in his abdomen; thought someone was trying to poison him. He now thinks that the lining of his stomach is loose and turned upside down. He eats well and is much improved in physical strength.

Physical examination is entirely negative.

CASE II.—Wilhelmina D. (see Table XX.), aged sixty years, married, housewife, native of Holland. One brother insane. Patient has always been of a nervous temperament; her mental ability was good. At the age of fifty she became insane, but recovered from this attack in about thirteen weeks. In April, 1897, she became insane again; she imagined that she was lost forever; that she had cancer of the stomach. She insisted that she felt something crawling in her stomach. She was frequently nauseated and at times vomited. Her sleep was disturbed and her appetite was poor.

The patient was admitted to the Michigan Asylum for the Insane September 28, 1897. She was depressed and worried because she thought she had a cancer. She abandoned this idea quite a little, however, when she was assured that such was not the case. Her delusions were those of hypochondria; she had a pain in a new place every day. She was removed from the asylum November 10, 1897; readmitted December 28, 1902, after having been in several institutions and taking a sea voyage. She was no better and had very painful delusions. She thinks her husband is going to shoot her, that people are running electric wires into her house, and that someone is going to chloroform her. She complains of her bowels rumbling constantly, so that she cannot rest; she is sure this condition is worse when the stomach is empty. She is much given to whining. It is thought that she is a morphine-eater. She has improved quite a little since her readmittance. Her appetite is good. She sleeps better, but her bowels are somewhat constipated.

Abdomen: There is tenderness in the region of the liver.

TABLE I.—Emma G.

Explanation of characters: + ++ = Lugol. M.B., V., R.V., R., and A.C. = Experimental meal.

Number.	Date.	Meal employed.	Motility tests. Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Acids. Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Ferments, etc. Pepsin egg tablet digested in	Rennen coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1900		hours	c.c.							hours	min.				
1	May 20	Ewald	1	24	Clear	0	++	36	42	111	3½	...	...	...	...	
2	" 20	Riegel	4	0	Much meat	...	...	...	...	...	...	...	...	...	...	By mistake meat was not chopped; tube clogged.
3	Dec. 6	Ewald	1	110	Practically clean	...	++	57	32	98	4	8	M.B.	0	0	
	1902															
4	Jan. 3	"	1	45	Very little bread	0	++	72	4	94	4	5	V.	0	0	Alizarin titration made with 1 c.c.
5	" 4	"	1	40	.....	0	++	64	8	78	...	5	V.	0	0	Patient hard to manage; no lavage given.
6	" 5	"	1	35	Much bread	...	++	65	12	82	4	...	R.V.	0	0	Titrations made with 1 c.c. except for total acid.
7	" 14	Asylum supper	14	0	See remarks	...	...	...	...	...	...	...	...	0	0	Only a few blood-stained strings of mucus could be obtained by washing.
8	" 18	Riegel	3½	0	Many small meat bits	...	0	...	...	...	...	...	...	...	...	A number of small meat bits found in wash-water.
9	Dec. 2	Asylum breakfast	4	...	.....	...	...	35	10	50	...	...	...	...	...	

TABLE II.—Clara H.

	1902		hours	c.c.							hours	min.				
1	Feb. 20	Ewald	1	80	Practically clean	0	+	78	20	108	4½	...	M.B.	0	0	
2	" 26	"	1	45	Practically clean	0	+	78	20	108	5	...	...	0	0	
3	" 28	Asylum supper	15	0	Nothing	...	...	...	...	...	...	...	...	...	...	Fasting stomach; patient absolutely refuses to eat any more test meals.

TABLE III.—Lizzie W.

	1901		hours	c.c.							hours	min.				
1	Feb. 22	Ewald	1	80	.....	0	+	64	18	92	3	10	R.	0	0	Lavage could not be given; patient much agitated.
2	1902 Jan. 27	"	1	150	.....	0	+	50	18	84	...	10	R V.	0	0	Very little mucus in washings.
3	" 31	"	1	80	.....	0	+	62	28	96	...	...	R.	0	...	Stomach fluid stood 24 hrs. before examined; no evaporation.
4	Feb. 1	"	1	125	.....	0	+	48	20	76	...	...	R.	0	0	
5	Nov. 30	"	1	65	.....	0	+	12	4	44	36 mm.*	x	R.V	...	...	
6	Dec. 2	Riegel	3	50	Some food	0	+	25	30	65	...	...	...	...	...	
7	" 3	Asylum supper	14	3	Little mucus	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE IV.—Mary B.

	1901		hours	c.c.							hours	min.				
1	Feb. 22	Ewald	1	80	.....	0	+	60	26	92	4	5	R.V.	0	0	Mucus not excessive.
2	Mar. 4	"	1	60	.....	0	+	42	12	72	2¾	5	R V.	0	0	Considerable mucus.
3	" 5	"	1	55	.....	...	+	54	18	76	4½	5	R.V.	0	0	
4	" 6	"	1	80	.....	0	+	46	32	88	...	...	R.	0	0	

TABLE V.—Hannah B.

	1902		hours	c.c.							hours	min.				
1	April 11	Ewald	1	60	.....	0	++	62	10	78	...	...	R.V.	0	...	Patient difficult to manage.
2	" 12	"	1	80	.....	0	++	52	6	66	...	...	R.V.	0	x	Few yeast cells and bacteria.
3	" 13	"	1	60	.....	0	++	48	10	64	...	...	R.V	0	x	Many yeasts.
4	May 20	Riegel	4	few	....	...	...	...	...	acid	...	...	...	0	...	Patient cannot be managed.

TABLE VI.—Olivia B.

Number.	Date.	Meal employed.	Motility tests. Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal	Acids. Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Ferments, etc. Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucous.	Important micro-organisms.	Remarks.
	1902		hours	c.c.							hours	min.				
1	May 14	Ewald	1	250	.....	0	++	46	20	74	4	...	M.B	0	0	Lavage omitted; patient violent.
2	" 16	"	1	200	.....	0	++	52	14	72	4	...	M.B.	0	0	" " " "
3	" 23	Riegel	3½	150	.....	...	++	48	30	96	3½	0	A.C.	0	0	Milk not curdled after two hours in oven; chymosinogen test was not made.
4	July 19	Ewald	1	200	.....	0	++	42	12	74	4	...	A.C.	0	0	Digestion of egg tablet complete.
5	" 19	Asylum supper	14	0												

TABLE VII.—Helen G.

	1902		hours	c.c.							mm.*	min.				
1	Dec. 30	Ewald	1	170	Clear	...	++	48	12	67	11	+	M.B	0	0	
2	" 31	"	7½ m.	58	"	...	++	50	16	73	15.5	+	R V.	0	0	
	1903															
3	Jan. 1	"	90 m.	60	"	...	++	50	13	70	15	+	R V.	0	0	Fasting stomach completely empty.
4	" 3	"	50 m.	...	....	...	++	30	14	68	7.8	+	...	+	0	Last observation of experimental meal.

* Peptic value, Mett's method.

TABLE VIII.—Anna R.

	1900		hours	c.c.							hours	min.				
1	Dec 1	Ewald	1	65	Clear.	0	++	52	26	84	6	7	R.V.	0	0	
2	" 1	Asylum dinner	3¼	...	"	0	0	...	...	...	...	...	...	...	...	Only a few shreds of meat recovered.
3	.....	Asylum supper	15	...	"	0	0	...	...	acid	...	...	...	...	...	Fasting stomach; very small amount of mucus recovered.

TABLE IX.—Hugo A.

	1902		hours	c.c.							mm.*					
1	Nov. 30	Ewald	1	57	Clear	0	++	34	20	74	11	+	R.V.	0	0	
2	Dec. 1	"	1	112	Little food	0	++	40	4	64	9½	+	"	0	0	
3	" 1	Asylum dinner	3½	5	" "	0	++	20	...	44	9	+	"	0	0	
4	" 2	Ewald	1	30	Much food	0	++	30	7	57	7.5	+	"	0	0	
5	" 2	Riegel	4	40	Clear	0	++	17	20	60	1	+	"	0	0	
6	" 23	Ewald	1	70	"	0	++	77	12	102	8.5	+	"	0	0	
7	" 24	"	1	36	"	0	++	60	14	84	10.5	+	"	0	0	
8	" 30	"	1	180	"	0	++	67	15	92	10.5	+	"	0	0	
9	Jan. 2	"	1	...	... .	0	++	30	2	40	8	+	"	0	0	Last observation of experimental meal.
10	Dec. 1	Asylum supper	14	15	Few bits toast	...	...	...	...	...	...	...	...	...	...	Fasting stomach; patient was seen eating toast a short time before.

TABLE X.—F. W. C.

	1902		hours	c.c.							mm.*					
1	Nov. 30	Ewald	1	68	Clear	0	++	60	16	90	5	+	R.V.	0	0	
2	Dec. 1	"	1	70	"	0	++	54	26	100	11.5	+	"	0	0	
3	" 1	Asylum dinner	3½	40	Much food	0	++	70	20	100	12.5	+	"	0	0	
4	" 2	Ewald	1	55	Little food	0	++	65	12	90	12.5	+	"	0	0	
5	" 2	Riegel	4	25	Clear	0	++	55	15	75	16	+	"	0	0	
6	" 23	Ewald	1	42	"	...	++	60	10	79	10.5	+	"	0	0	
7	" 24	"	1	28	"	...	++	57	8	76	14	+	"	0	0	
8	" 26	"	70 m.	30	"	...	++	54	7	67	8	+	"	0	0	
9	" 28	"	45 m.	0	"	...	++	35	...	48	8	+	"	0	0	Last observation of experimental meal.
10	" 1	Asylum supper	14 h.	0	....	...	...	...	...	...	...	...	"	0	0	

TABLE XI.—Hugh L.

	1902		hours	c.c.							mm.*					
1	Nov. 30	Ewald	1	208	Clear	0	++	50	0	70	3	+	R.V	0	0	
2	Dec. 1	"	1	205	"	0	++	54	0	74	11.75	+	"	0	0	
3	" 1	Asylum dinner	3½	60	Little food	0	++	34	16	70	8.5	+	"	0	0	
4	" 2	Ewald	1	114	Much food	0	++	60	5	75	12.33	+	"	0	0	
5	" 2	Riegel	4	118	Clear	0	++	68	19	98	14	+	A.C.	0	0	Stomach washings before meal perfectly clear.
6	" 22	"	1	350	"	...	++	56	6	70	11	+	R.V.	0	0	
7	" 24	"	1	150	"	...	++	50	8	65	9.5	+	"	0	0	
8	" 26	"	70 m.	150	"	...	++	43	10	55	12	+	"	0	0	
9	" 28	"	1 h.	.....	.....	...	++	40	5	56	...	+	"	0	0	Last observation of experimental meal.
10	" 1	Asylum supper	15	0	.....	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XII.—Geo. K.

Number.	Date.	Meal employed.	Motility tests. Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Acids. Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Ferments, etc. Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c.c.							mm.*					
1	Dec. 30	Ewald	1	156	Clear	0	++	40	20	80	7	+	R.V.	0	0	
2	Jan. 1	"	1	95	"	0	++	38	19	70	13	+	"	+	0	Suspected tissue bit found, but was accidentally lost.
3	" 1	Asylum dinner	3½	76	Little food	0	+	16	8	32	2	+	"	0	0	Mucus slightly increased.
4	" 2	Ewald	1	90	Clear	0	++	51	7	65	16	+	"	0	0	
5	" 2	Riegel	4	32	"	0	++	90	10	108	14	+	A.C.	0	0	Stomach washings before meal were perfectly clear.
6	" 23	Ewald	1	38	"	...	0	0	2	12	8	+	R.V.	...	...	
7	" 24	"	1	30	"	...	0	0	0	10	6	+	"	...	...	
8	" 26	"	1	52	"	0	0	0	0	12	7	+	"	...	...	
9	Feb. 1	Asylum supper	14	0	.....	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

TABLE XIII.—Frank K.

	1902		hours	c.c.							mm*.					
1	Nov. 30	Ewald	1	35	Clear	0	++	30	14	64	11	+	R.V.	0	0	
2	Dec. 1	"	1	70	"	0	++	27	17	50	12	+	"	0	0	Mucus slightly increased.
3	" 1	Asylum dinner	3½	5	"	0	...	...	...	...	...	...	...	0	0	
4	" 2	Ewald	1	90	Little food	0	+	8	7	27	½	+	A.C.	0	0	
5	" 2	Riegel	4	10	Clear	0	+	10	5	25	0	+	M.B.	0	0	
6	" 23	Ewald	1	155	"	...	++	50	11	68	12	+	R.V.	0	0	
7	" 24	"	1	60	"	...	++	71	10	92	9 5	+	"	0	0	
8	" 26	"	1	100	"	...	++	50	14	70	11	+	"	0	0	
9	" 29	"	1	..	....	...	++	52	10	78	8	+	"	0	0	Last observation of experimental meal.
10	" 1	Asylum supper	0	...	.....	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XIV.—Hermon O.

	1900		hours	c.c.							hours	min.				
1	Dec. 8	Ewald	1	90	Some bread	0		28	12	50	5	10	M.B.	0	0	
	1901															
2	Mar. 5	"	1	150	.....	0	+	50	18	78	5	10	R.V.	0	0	
3	" 6	"	1	150	.....	0	+	62	18	88	...	...	"	0	0	
	1902															
4	Dec. 1	Asylum breakfast	3.5	50	Clear	0	+	30	6	64	5	+	"	0	0	Bread, butter, potatoes, coffee.
5	" 7	"	2	98	Much bread	+	0	0	15	40	0	+	"	0	0	Hash, gravy, oatmeal, bread, coffee.
6	" 7	Fasting	14	0	.....	...	...	...	...	...	...	...	...	0	0	

TABLE XV.—Geo. E. B.

	1902		hours	c.c.						mm.*					
1	Dec. 31	Ewald	1	80	Clear	...	++	62	15	87	14	+	R.V.	...	...	
	1903															
2	Jan. 1	"	1.5	110	"	...	++	63	14	86	12	+	"	...	...	
3	" 2	"	1	24	"	...	++	36	5	50	12½	+	"	...	...	
4	" 3	"	1	...	.....	...	++	62	18	87	...	+	...	...	...	Last observation of experimental test meal.
5	" 3	Asylum supper	15	0	Clear	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XVI.—John V.

	1901		hours	c.c.							hours	min.				
1	April 19	Ewald	1	65	.....	0	+	56	18	80	4½	...	R.V.	0	0	Patient became cyanotic; tube withdrawn early; no lavage.
2	" 20	"	1	20	.....	...	+	58	16	78	...	10	"	0	0	Patient cyanotic; crying.
3	" 22	"	1	50	.....	0	+	38	22	70	4½	8	R.	0	0	" " "
4	" 25	Asylum supper	15	0	.....	...	...	...	...	...	...	...	...	0	...	Fasting stomach.
5	" 26	Asylum dinner	4	0	Much food	...	...	...	...	...	...	...	...	...	...	Hard to manage.

TABLE XVII.—Frank S.

Number.	Date.	Meal employed.	Motility tests. Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Acids. Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Ferments, etc. Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important microorganisms.	Remarks.
	1901		hours	c.c.							hours	min.				
1	Apr. 19	Ewald	1	8	....	0	++	..	...	...	4	...	R.V.	0	0	Color dark brown; some altered and fresh blood.
2	" 20	"	1¼	1	Few shreds of mucus.	...	...	...	...	...	...	...	...	+	0	Nothing could be obtained after 15 minutes' effort; tissue bit in eye of tube
3	" 22	"	¾	20	"	0	++	40	30	80	3	8	R.V.	0	0	Color brownish; many R.B.Cs.; 1 c.c. used for each test.
4	" 24	Leube	2¼	0	"	..	...	...	...	...	...	...	...	0	...	
	1902															
5	Jan. 6	Ewald	1	0	Few flakes of bread	...	...	...	...	acid	...	...	...	0	...	
6	" 7	"	1	55	Clean	0	++	64	10	90	3½	10	R.V.	0	0	Few fat globules from supper the evening before.
7	" 8	"	1	3	.....	...	faint	...	...	...	...	...	...	0	...	Only a few c.c. of brownish mucus could be obtained
8	" 10	"	1	4	Much bread	...	"	...	...	...	...	...	...	0	...	Nothing could be obtained after 15 minutes' effort until lavage was given.
9	" 11	"	1	75	Practically clean	0	++	46	20	72	3½	...	R.	0	0	
10	" 12	"	1	15	Much bread	...	++	...	...	...	...	...	...	0	...	
11	" 13	Asylum supper	15	0	Clean	...	...	...	...	...	...	...	...	0	...	No test for HCl could be obtained in wash water.
12	" 14	Asylum dinner	2¼	few	.....	...	...	...	...	...	...	...	...	0	...	
13	" 18	Riegel	3½	"	Clean	...	...	...	...	...	...	...	...	0	...	
14	July 11	Ewald	1	150	.....	0	++	56	28	90	4	...	R.V.	0	...	
15	" 19	"	1	100	.....	0	++	54	8	68	+	...	...	0	...	

TABLE XVIII.—Martha Y.

			hours	c.c.							hours	min.				
1	1900 Nov. 6	Ewald	1	20	Clear	...	++	40	44	104	5	...	...	0	0	Ate very little milk before test meal.
2	1901 Feb. 26	"	1	24	.....	0	++	50	20	100	2½	10	M.B.	+	0	One small bit mucosa in eye of tube.
3	" 27	"	1	65	Clear	0	++	36	12	72	3	...	R.V.	+	0	One large bit mucosa.
4	Dec. 10	Asylum dinner	3⅓	0	Small bit carrot	...	...	...	...	...	...	...	...	...	...	Meal of meat and potato stew, carrots, bread pudding; only few flecks of mucus.
5	" 17	Ewald	1	35	Clear	0	++	45	15	75	...	...	...	...	...	Titrations made with 1 c.c.
6	" 18	"	1	30	"	0	++	40	10	50	3½	10	R.V.	+	0	One small bit of mucosa.
7	" 20	"	1	40	"	...	++	70	30	100	4	...	"	0	0	Contents kept over night; froze; no evaporation; two titrations.
8	1902 Jan. 3	"	¼	55	.....	0	++	44	6	66	4	5	"	0	0	
9	" 4	"	1	20	Clear	0	++	60	10	70	...	5	"	0	0	Test made with 1 c.c.; repeated.
10	" 5	"	1	45	Few flecks mucus and bread	...	++	48	10	62	3½	...	"	0	0	
11	Feb 19	Asylum dinner	2¾	40	Much	x	0	30	35	90	...	...	...	0	0	Meal of beef, potatoes, bread, milk, cake; very faint reaction with Uffelmann.
12	Jan. 12	Asylum supper	14	0	Few flecks mucus	...	.	...	...	...	...	...	...	0	...	
13	" 14	Asylum dinner	3	much	.....	...	0	...	...	...	...	...	...	...	...	
14	May 2	R egel	3.5	20	Few bits meat	0	++	34	...	60	...	...	...	...	...	
15	" 22	Asylum dinner	3	0	"	...	...	...	...	...	...	...	...	...	...	Meal of mac. sup., beef, bread, butter, milk, onions. Fasting stomach examined several times and found empty.

TABLE XIX.—Arthur P.

				c.c.							mm.*					
1	1902 Dec. 30	Ewald	65 m.	170	Clear	...	++	48	12	67	11	+	R.V.	0	0	
2	" 31	"	1 h.	76	"	...	++	45	10	68	11	+	"	0	0	
3	1903 Jan. 1	"	90 m	12	"	...	++	38	3	55	12	+	"	0	0	
4	" 1	Asylum supper	15 h.	0	"	...	...	...	...	...	...	...	...	...	...	Fasting stomach.

* Peptic value, Mett's method.

TABLE XX.—Wilhelmina D.

Number.	Date.	Meal employed.	Motility tests. Time in stomach.	Amount recovered.	Condition of stomach washings after removing test meal.	Acids. Lactic acid (Uffelmann).	Hydrochloric acid (Gunzberg).	Free hydrochloric acid.	Combined hydrochloric acid.	Total acid.	Ferments, etc. Pepsin egg tablet digested in	Rennin coagulation of milk occurred in	Starch digestion (Lugol).	Bits of mucosa.	Important micro-organisms.	Remarks.
	1902		hours	c c.							hours	min.				
1	Jan. 16	Ewald	1	130	Few small bits bread.	0	++	42	28	72	4	5	R.	0	0	
2	" 17	"	1	145	Nothing	0	++	40	18	68	4⅓	5	R.V.	0	0	
3	Feb. 15	"	1	150	"	0	++	38	26	70	3	5	"	0	0	Ate 10 gms. more bread than before.

TABLE XXI.—Harrington W.

	1902		hours	c.c.							mm.*	min.				
1	Nov. 30	Ewald	1	0	Clear	...	...	...	...	...	...	...	...	0	0	
2	Dec. 1	"	1	8	"	...	0	0	0	8	0	0	R.V.	0	0	
3	" 1	Asylum dinner	3	3	"	0	0	0	...	...	0	0	...	0	0	
4	" 2	Ewald	1	5	"	0	0	0	0	0	...	...	R.V.	0	0	
5	" 2	Riegel	3	0	"	0	0	0	0	0	0	0	0	0	0	
6	" 1	Asylum supper	14	0	"	...	...	...	...	...	...	...	...	0	0	Fasting stomach.

TABLE XXII.—W. E. G.

	1902		hours	c.c.							mm.*	min.				
1	Nov. 30	Ewald	1	34	Clear	0	0	0	0	2	0	0	R.V.	0	0	Excessive mucus.
2	Dec. 1	"	1	46	"	0	0	0	0	2	0	0	"	0	0	" "
3	" 1	Asylum dinner	3.5	68	"	0	0	0	0	10	0	0	"	0	0	" "
4	" 2	Ewald	1	82	"	0	0	0	0	15	0	0	"	0	0	" "
5	" 2	Riegel	4	10	"	0	0	0	0	10	0	0	A.C.	0	0	Mucus normal; stomach washings before
6	" 1	Asylum supper	14	0	"	...	...	...	...	...	...	...	...	...	...	Fasting stomach. [meal perfectly clear.

* Peptic value, Mett's method.

CASE III.—Harrington W. (see Table XXI.), aged sixty-three years, widower, American, farmer. No insanity in family. Admitted to asylum October, 1896. In the spring of 1896 patient complained of indefinite symptoms on the part of his stomach. He began to worry about financial affairs and about his health. He was hypochondriacal and thought himself unable to work. Delusions of health continued. In April, 1897, he thought his bowels did not move and that this was due to a growth occluding the passage. He begged for an operation. He refused to eat, wanted to starve himself. Forced feeding had to be instituted. He was markedly depressed. November 1, 1899, he attempted suicide. October 15, 1900, second suicidal attempt. Bowels regular.

Patient is well nourished.

Blood: Red cells, 4,000,000; hæmoglobin, 70 per cent.; white cells, 5490.

Urine: Negative.

Weights: 1897, 170 pounds; January, 1902, 193 pounds; April, 187 pounds; June, 200 pounds; August, 196 pounds; November, 184 pounds.

CASE IV.—W. E. G. (see Table XXII.), aged forty-eight years, married, American, occupation unknown. Previous to his mental trouble patient was always of a cheerful disposition, quiet, and talked but little about his business.

In August, 1901, he began to cry; little other change was observed; several weeks after this he became much worried about the wood, and thought he and his family would freeze to death. Insomnia developed. His appetite was fair, but at times he believed something was wrong with his food. At one time he attempted to jump out of a window, as he thought the house was on fire.

Patient was admitted to the asylum March 10, 1902. He was very much depressed; he answered questions with great reluctance. He had hallucinations of hearing; would stop and listen to imaginary voices. He became very apprehensive, believed that other inmates composed an army brought to the institution to kill him. He was restless, constantly moving about the ward. His condition continued the same until May 29, 1902, when he was taken to his home for a visit. While there he secured a revolver and shot himself.

Physical examination entirely negative.

Stomach in normal position.

CONCLUSIONS. 1. In states of mental depression (melancholia) hyperacidity is the rule, occurring in 71.4 per cent. of von Noorden's 14 cases, 81.8 per cent. of our 22 cases, or in 77.7 per cent. of all cases (36 in number). Males and females are equally affected.

2. This hyperacidity is due to a true hyperchlorhydria. Hypertotal acidity also occurred in our cases, and in this respect they correspond exactly with those reported by von Noorden.

3. The hyperchlorhydria is of moderate degree, is fairly constant, and is associated with increased peptic power and rapid evacuation.

4. The increased secretion is due to the neurosis or psychosis and not to proliferative changes in the glands, as is evidenced by the presence of increased secretion associated with degenerative changes in the glandular elements, and of the entire mucosa.

5. The evacuation of the stomach is usually normal or somewhat hastened after the Ewald test breakfast, while after the large stimulus of the Riegel meal and ordinary Asylum meal it is more frequently hastened.

6. In the cases showing hyperchlorhydria the peptic value is never below normal and is frequently increased.

7. Many of the insane are suffering from various forms of gastro-intestinal disease. These conditions are very frequently overlooked, probably because complaints and delusions of the digestive tracts are so common in these patients. Our experience and the results of this investigation prompts us to urge the absolute necessity for systematic routine examinations of all the secretions and functions, of the body including what is often a very difficult task, the examination of the stomach contents. The signs of disease in the insane are almost wholly objective, and here more than in normal mental states it is essential that every modern method of value should be exhausted in order to arrive at a complete diagnosis of the case. Cancer and ulcer of the stomach may thus often be recognized in its incipiency. Chronic gastritis in its several forms, as well as the painful neuroses, will also often be encountered. If proper treatment be instituted it is not at all improbable that the mental symptoms in these cases will proportionately decrease.

SOME REMARKS ON THE NATURE AND CLASSIFICATION OF INSANITY.[1]

By Theodore Diller, M.D.,
of Pittsburg.

The ancient truism that a sound mind results from a sound body implies that the mind is not sound when the body is diseased. An unsound body may be expected to produce symptoms and physical signs by which its diseased condition may be recognized. Among the manifestations of the diseased body are those symptoms which are called mental. But mental symptoms are seldom or never the sole manifestations of bodily disease. Yet they are often so conspicuous as to dominate the clinical picture and lead us to lose sight

[1] A paper read before the Annual Meeting of the American Neurological Society held at St. Louis, September 17, 1904.

of the physical signs and symptoms which almost always, in a more or less marked degree, accompany the mental symptoms. The mental symptoms are commonly divided arbitrarily into two classes: those which constitute insanity and those which, because they are insufficient in number, degree, kind, or duration, are held to be inadequate to constitute insanity. In other words, it is commonly held that all departures from the mental norm do not constitute insanity, as, *e.g.*, the mental manifestations in fevers, Bright's disease, neurasthenia, chorea, etc. What and how many and how prolonged mental symptoms must be to constitute insanity are questions of individual opinion. We have had enough discussion of the subject of insanity to be able to reach the conclusion that it has never been and never can be defined in such a manner as to meet with anything like general acceptance.

Abnormal mental manifestations are measured by terms such as "severe," "prolonged," "insufficient," etc., as against "inches," "ounces," etc., in dealing with the purely physical; and it is therefore not to be wondered at that the term insanity is a variable and arbitrary one, since the standards of measurement are elastic and inexact; and description of mental symptoms must, therefore, always reflect the personal equation of him who makes it.

The term insanity is used to designate a more or less severe, prolonged, and comprehensive group of mental symptoms, and for the reasons stated there is no way of differentiating it sharply from the great mass of mental symptoms which in general are not held to constitute insanity. And yet many observers have felt that they *must* decide as to whether the mental symptoms present in a given individual constituted insanity or not, as though insanity were a clinical entity which could always be recognized if we are only keen enough to do so; and so it always can be, according to the observer's own standard of insanity, which is never exactly like that of any other observer.

Insanity, a large group of mental symptoms, is treated as though it were itself a grand division of disease, capable of division into groups and sub-groups. As the range of the normal mind is infinite, so is that of the abnormal, and the attempts to classify insanity have always been futile, no two authors ever agreeing quite as to what must be present or absent to constitute it, or as to the exact characteristics of any given group.

For the purely scientific study of mental symptoms, the varying needs of legal requirements should be wholly disregarded. Attempts to formulate definitions of insanity for the law have clouded the whole study of abnormal mental manifestations.

Happily there is a breaking down of some of the artificial and arbitrary distinctions by which varieties of mental diseases were formerly erected. For example, mania formerly regarded by many as a well-established disease is no more such than is dyspnœa, or

hallucinations, or œdema, or palpitation. It is a symptom-complex dependent, like dyspnœa, upon a great variety of causes, and it may be a marked, prolonged, or intermittent symptom, or the reverse. It may be the main symptom or one of many symptoms of disease. The same may be said of melancholia, dementia, paranoia, etc. I have not been able to convince myself that we have gained much of value by hitching the maniacal and melancholic symptoms together under the designation of maniac-depressive insanity. An unprejudiced statement would be that the patient presented maniacal, melancholic, or paranoic symptoms, just as we now say he has delusions or hallucinations or obsessions.

A great fundamental error which has given rise to many others arises from the attempt to divide disease into mental and physical, as though they were not only separate and distinct divisions of it, but even dependent upon different causes. It has caused us to lose somewhat the sense of unity of disease as a whole, and has created a distinction which is artificial and non-existent. All disease generally speaking, manifests itself both by mental and physical signs and symptoms. How common are the minor (to say nothing of the major) mental symptomatic expressions of physical disease. On the other hand, even in such a gross disease as a brain tumor, has been found to be the cause of insanity. Head, in a painstaking article,[1] has made a series of interesting observations on the mental symptoms noted in a variety of physical disease. Similar investigations by Gamble[2] led him to similar observations.

This study of mental symptoms in so-called physical disease is a comparatively untilled field of inquiry, from which we may hope to learn much by further investigations. When mental symptoms are observed in well-recognized physical disease, as, *e. g.*, brain tumor or arteriosclerosis or meningitis, we do not say that they constitute insanity, even though it would be called such *if the physical disease were unknown*. While in some diseased conditions physical symptoms are conspicuous and mental symptoms but slightly in evidence, in other cases the symptomatic expression is just the reverse; but in the latter class of cases insanity is never the sole expression of disease. Some physical signs, such as altered pulse or respiration or tongue or skin or muscular movements, always accompany them. The absurdity of considering a group of mental symptoms as a disease becomes more obvious when we consider how to many of them various authors have attached physical symptoms or signs.

[1] Brain, 1902.

[2] Johns Hopkins Hospital Bulletin, July-August, 1904. Among Gamble's observations were the following: Hallucinations of sight in a case of mitral stenosis; hallucinations of smell in a case of asthma; hallucinations of hearing with alternating depression and exaltation in a case of adherent pericardium; alternating depression and physical exaltation in a case of mitral stenosis with failing compensation; loss of attention and memory and fears in a case of asthma with emphysema; loss of attention and memory, and confusional ideas in several cases of arteriosclerosis.

Symptoms of disease of all kinds then are to be referred to altered or defective or malformed physical structures in which the organ of the mind—the cerebral cortex—must share when mental symptoms are present. That the exact physical basis for the explanation of many mental symptoms is unknown does not invalidate this statement. In such cases such a basis must be postulated.

Indeed, I believe we are making some advance toward this position. Paresis, formerly accounted an insanity, is now recognized as a physical disease, presenting striking physical as well as mental symptoms; and it is now, as should be the case, described in text-books on the practice of medicine. Krafft-Ebing, in his text-book on insanity, significantly describes in a separate section, "Brain Diseases with Predominating Psychic Symptoms," under which he includes besides paretic dementia, acute delirious mania, cerebral syphilis, and senile dementia.

The painstaking observer is more and more impressed with the number of physical signs and symptoms observed in so-called insanities. In so-called acute delirious mania and conditions approaching it, the dry tongue, the sordes of the teeth, the elevated temperature, and the altered urine, all speak for a form of auto-intoxication with marked metabolic changes. In not a few of the so-called physical diseases, as, for example, Bright's disease, arteriosclerosis, multiple neuritis, syphilis, and cardiac disease, the mental symptoms may be among the most striking presented by the disease.

Since insanity is a term which is indefinable and one to which a stigma of disgrace is attached, and since its acceptance or recognition tends to make it something other than an expression of physical disease, malformation or defect, it would be well if, as suggested by Dr. Richard Dewey, the term could be abandoned as serving no useful scientific purpose and as tending to place the investigation of mental symptoms on a false basis, and if the term psychosis were used in its stead and to include all abnormal mental manifestations. But we can hardly hope to dismiss a term used for many ages. Something might be gained, however, if the term were written between quotation marks to denote its infinite and indefinable character.

But it may be objected if the term insanity, with its division into groups, be abolished or side-tracked, we shall still have the symptoms and physical signs which go to make it up. True enough; but we shall be in better position to study them from the anatomical, physiological, pathological, chemical, and psychological basis. Then we will be in better position to study each case of disease on its own merits, without the forced necessity of placing it in some artificial classification. The patient with maniacal symptoms will not be called a case of mania and dismissed with this label, for we know that this symptom may arise from Bright's disease, in acute intoxica-

tion, or exhaustion, as an episode in paretic dementia or paranoia, and in many other conditions. We will search more thoroughly for its underlying basis.

But like the term insanity itself, some of its forms have names which are in general use, like paranoia, dementia præcox, etc.; and it must at once be admitted that these cannot readily be dismissed, even if it were desirable to do so. Let them then be used as arbitrary, tentative, and temporal names for certain groups of symptoms, not as names of diseases. But let us by studies of individual cases avoid the danger of attaching undue importance to a mere name. Let the name not be a stumbling-block, a hindrance, a check to individual study of symptoms and signs as they exist in individual cases.

The whole of the study of mental symptoms as a partial expression of disease would be immeasurably advanced if the patients exhibiting them were treated in the same hospitals with patients who suffer from so-called physical disease. Thus the profession and the laity alike would have an objective lesson which would teach them the unity of disease, and do more than anything else to remove the stigma of reproach from the term insanity and lessen the employment of the term itself, and, furthermore, do much to place the study of mental symptoms themselves on a proper basis.

One or two general hospitals in every city should have a few wards properly equipped to deal with patients who exhibit marked mental symptoms. Patients of this kind, like those of any other class, should not be received or retained after they have become chronic. In a quiet, unobtrusive way, St. Francis Hospital, of Pittsburg, has for many years provided four such wards, and the writer can personally testify that they have served a highly useful purpose, and justify the statements just set forth. We know no other general hospital in this country which makes a similar provision. A few general hospitals abroad provide such wards for patients with mental symptoms, the splendid new hospital at Nuremburg being the latest so equipped.

It is in our opinion highly desirable that such provision should become very general, and recent expressions of opinion seem to indicate that the day is not far distant when this desideratum will be attained.

THE RELATION BETWEEN CLIMATE AND HEALTH, WITH SPECIAL REFERENCE TO AMERICAN OCCUPATION OF THE PHILIPPINE ISLANDS.[1]

By William S. Washburn, M.D.,
CHAIRMAN OF THE PHILIPPINE CIVIL SERVICE BOARD, P. I.

The purpose of this paper is to discuss the relation between climatic conditions and health, with special reference to Americans in the Philippine Islands. The subject involves a study of climatological reports, medical literature, and statistics. Climatic laws, especially those relating to the tropics, will first be briefly reviewed.

The Director of the Philippine Weather Bureau, Rev. José Algué, clearly expresses the meaning of the term climate in the following definition: "The climate of a country is the complex of the average atmospheric conditions which have an influence upon organic life; therefore, an adequate study of the different elements which go to make up these atmospheric conditions would give a true idea of the climate. The more important elements which form the climate may be reduced to three—viz., heat or temperature; water vapor in its different forms, such as humidity, evaporation, clouds, and precipitation; and finally, the movement or circulation of the atmosphere, which includes the direction and force of the wind, cyclonic and non-cyclonic storms, together with local and general storms."

While temperature is the fundamental phenomenon of climate, several different elements form the basis of its classification, and each classification is affected or modified by other elements or influences. For example, on the basis of temperature we have hot, mild, temperate, and cold climates; on the basis of the influence of continents and oceans, climates are classified as oceanic, insular, and continental; on the basis of salubrity, as healthful and unhealthful.

On account of the spheroidal shape of the earth, temperature varies generally with latitude, but other elements, such as elevation, the presence or absence of vegetation or of large bodies of water, movements of the atmosphere, water vapor in the atmosphere, marine currents, and configuration of land, bring about sharp contrasts in the same latitude, and have a marked influence on animal or vegetable life, or both.

About five degrees each side of the equator is a zone of calms and almost daily thunder showers; beyond this to twenty degrees, a zone of periodical rains in summer, in which zone lie the Philippine

[1] A paper read at the Second Annual Meeting of the Philippine Islands Medical Association.

Islands, characterized by a wet and a dry season; from twenty to twenty-eight degrees, a subtropical zone, in which are the deserts of Sahara, Arabia, and of Northern India, and the arid region of Mexico and Lower California; from twenty-eight to forty-five degrees, a belt of semi-periodical rains, characterized by four seasons and prevailing sunny days (the United States lies principally in this belt).

With respect to elevation above the sea level, there is an average variation of about one degree of temperature for every 300 feet, which is well illustrated by the difference in temperature between Manila and Baguio, Benguet province.

Forests and other vegetations and large bodies of water tend to counteract the effects of terrestrial radiation, and thereby to equalize local climates. On the other hand, a region barren of trees and other vegetation permits wide daily fluctuations of temperature, the days being hot and the nights cold, which become extreme in barren places and arid regions, rising to a mean summer temperature of 95° in Arabia, Persia, and Punjab, India; in the Punjab 125° in the shade has been observed. In a country covered by forests and other vegetation, and in proximity with large bodies of water, the total heat of the day is quite equally distributed over the twenty-four hours, the heat of the day not being excessive, even in the tropics, as illustrated by climatic conditions in the Philippines.

Temperature is greatly modified by movements of the air or winds, which constitute an important climatic influence by increasing evaporation, thus rendering the soil drier, removing dampness, and affecting the "sensible temperature," that is, the apparent temperature which we feel or the physiological temperature. In the tropics, practically covered by the longitudinal extent of the Philippine Islands and from six to twenty degrees north latitude, is a zone of trade winds called monsoons in the Indian Ocean and adjacent portions of the Pacific. Cyclonic movements of the atmosphere, characterized by regularity of course, are called hurricanes in the West Indies and the Indian Ocean, cyclones in the Gulf of Bengal, typhoons in the China Sea, and baguios in the Philippine Islands. The central and northern portions of the Philippine Archipelago lie in the path of these baguios or cyclones, but these regions are free from the cold, raw winds frequently experienced in New England and Canada, in connection with the course of cyclones in that region. Due to similar cyclonic atmospheric movements, the entire Mediterranean region is subject to violent changes of temperature in winter. The central portions of the United States, considerably distant from the sea, are also subject to violent atmospheric changes, where a day that dawns with the ethereal mildness of spring may end in the freezing coldness of winter.

The water vapor of the atmosphere constitutes an important climatic element. The atmosphere contains a variable quantity of

moisture, resulting from vaporization of water through the action of heat rendering it lighter than air. The higher the temperature of the air the more water vapor it can carry, and when increased to the point of saturation, if the temperature is lowered, condensation occurs and results in precipitation in the form of rain or dew, clouds or fog. A rise of temperature, therefore, renders the air drier, and a lowering of temperature, more moist. The greatest amount of evaporation being in equatorial regions produces the equatorial and polar atmospheric currents, which have an important climatic influence on contiguous land bodies. The average quantity of annual rainfall reaches the maximum in the tropics, while the *number* of cloudy or rainy days gradually increases from the equatorial regions toward higher latitudes, and decreases from the coasts to the interior of continents.

The heated waters of the tropics, flowing away from the equatorial regions, are replaced by the colder waters of the polar currents. Moreover, the cold produced by radiation over the surface of the ocean and land adjoining lowers the temperature of the water, which sinks to greater depths, so that, even in the tropics, deep sea observations show the water below the surface to be increasingly cold toward the depths of the sea, where it approaches the freezing point. Local interisland currents, as the Straits of San Bernardino and Surigao, materially modify the temperature of neighboring regions. The following are examples of the influence of marine currents: Washington, D. C., with cold winters and hot summers, is in the same latitude as San Francisco, whose mild winters and comparatively cold summers are due to the influence of the Japan current modified by its sweep across the Northern Pacific. On one side of the Atlantic Ocean is Labrador, treeless and cheerless; on the other side, in about the same latitude, are the British Isles, with abundant vegetation and a comparatively mild climate, which is due to the influence of the northern branch of the Gulf stream. Labrador is subjected to the influence of the cold Labrador or polar current.

In the classification of climates, based on the size and extent of masses of land, oceanic, insular, and continental, the climate of the Philippine Islands is largely that of the first two classes, oceanic and insular. Nowhere is the land distant from the seacoast more than sixty miles. The moderating influences of the great bodies of sea water are therefore operative. On account of climatic influences, the climate of the Philippines is widely different from those of tropical Africa, South America, and Asia in the same latitude. As a rule, the smaller the island the more equable the climate throughout the day and the year. The climate of the greater part of the Philippine Archipelago is for this reason comfortable and hygienically favorable for the treatment of many diseases. In the temperate zone an insular, mild, or equable climate is frequently a health resort.

Observations of the Manila Observatory show that while the temperature as indicated by the thermometer at *sea level* is practically the same throughout the Philippine Archipelago it is higher in some regions than in others during the months of April, May, and June, which cover the period of greatest heat.

During this season there is a mean temperature of about 87° in the northern part of the island of Panay and throughout the Island of Luzon, except the highlands and a portion of the provinces of Pampanga, Bulacan, Rizal, and Bataan.

During this period there is a mean temperature of about 83° in the parts of Luzon excepted above, including Manila and the islands of Romblon and Cebu, the peninsula of Zamboanga, and the west coasts of Samar, Negros, Panay, and Bohol.

A comparatively mild mean temperature of about 80° prevails during this period over the Sulu Archipelago, the extreme southeast of Luzon, and the eastern portions of those islands south of Luzon and contiguous to the Pacific Ocean—viz., Samar, Leyte, and Mindanao. If the readings of the thermometer for the elevated regions were included, these averages would be very considerably reduced.

Except for the months of April, May, and June, in the first and second regions named above, the mean temperature for the remaining part of the year at or near the sea level is about 80°. The observations of the Manila Weather Bureau further show that the annual variation of temperature is greater in the northern than in the southern part of the archipelago.

Some portions of the Philippine Islands are characterized by a rainy season and a dry season, the rainy season gradually beginning in June, being excessive usually in July, August, and September, and gradually decreasing to November; while in other parts of the archipelago there is a more even distribution of rain. Parts of the eastern coast of Northern Luzon and the interior of Luzon above 4000 feet, the Pacific Ocean side of the archipelago, including the eastern portions of the islands of Masbate, Panay, and Bohol, are subject to the heaviest rainfall, amounting to over 100 inches annually. In the other parts of the archipelago, including Manila, the mean annual rainfall is less than 100 inches, decreasing to about 35 inches at Zamboanga.

The geological formation of the Philippine Islands is of volcanic origin, and in places of moderate elevation the earth covered by cultivatable soil is not unhealthful.

The observations of the Manila Weather Bureau show a considerable difference in climate between the coastal regions of the islands of the archipelago and the elevated regions of the islands of Luzon and Mindanao. Mountain climate in these two islands is similar to that of Baguio, Luzon, whose altitude is 4777 feet and whose average temperature and humidity are relatively low during the hot months of March, April, May, and June, owing to the prevailing winds blowing from the China Sea during that season. The

climate of this region is ideal from November to June. The region consists of a rolling table-land well watered. The forests are of pine, and the soil productive. The vegetation is similar to that of the temperate zones. The following table is made up from observations at Baguio covering a period of two or three years:

Month.	Temperature (Fahrenheit).			Humidity (per cent.)	Rainfall (inches).	Rainy days.
	Mean.	Maximum.	Minimum.			
January	63.14	75.38	49.28	78.1	0.92	4
February	60.98	73.94	45.68	77.3	0.21	1
March	65 66	78.44	51.08	76.3	1.09	3
April	68.00	80 24	51.80	75.5	1.66	6
May	67.46	78.80	52.52	83.9	9.42	18
June	66.38	77.72	58.10	89.4	15.92	26
July	65.84	79.70	56.30	89.4	15.33	28
August	65.12	75.74	54.68	92.2	42.89	31
September	65 66	74.48	57.20	90.5	17.81	26
October	65.56	75 92	55.40	83.7	6.65	14
November	65.84	75.56	52.16	79.0	2.75	10
December	64.94	75.02	54.68	81.2	3.19	10
Year	65.48	76.82	53.24	83.0	117.84	177

With a mean annual temperature of 80°, an annual average humidity of about 79 per cent., and an average annual rainfall of about seventy-six inches, Manila occupies an intermediate position in the archipelago, climatically as well as geographically. The average annual rainfall is less than that of Baguio (118.04), Albay (110.90), Negros (102.02), Singapore (93.22), Bombay (92.72), and Hongkong (86.85), and more than that of Batavia (71.15), San Isidro (70.71), Iloilo (69.85), Calcutta (60.83), New Orleans (60.30), Porto Rico (59.45), Jolo (59.28), Tokyo (57.78), Havana (51.74), Cebu (47.18), New York (44.70), Shanghai (44.06), Washington, D. C. (42.90), Honolulu (39.22), Key West (38.20), Zamboanga (34.89), Chicago (34.00), and San Francisco (23.40).

In Manila the average amount of sunshine, measured by hours, and its distribution corresponds closely with the average clear and partly cloudy days for each month and for the year, as shown in the following table:

Month.	Average clear and partly cloudy days.
January	23.9
February	23.8
March	23.9
April	25.1
May	19.9
June	17.3
July	14.9
August	14.0
September	13.1
October	17.1
November	18.6
December	22.6
Total	234.2
Average	19.5

From this table it is seen that the minimum of clear and partly cloudy days in Manila occurs in September, and the maximum in April.

The climate of Manila is quite fully demonstrated in the following table, made up from observations of the Manila Weather Bureau covering a period of over twenty years, giving the mean monthly and annual temperature, the mean daily, monthly, and annual ranges of temperature, the normal average of the humidity, the normal amount of rainfall, and the average number of days of rainfall:

Month.	Temperature (Fahrenheit).					Mean humidity.[1]	Mean rainfall.[2]	Mean rainy days.
	Mean	Mean monthly max.	Mean monthly min.	Mean daily range.	Mean monthly range.			
January	77.18	89.78	64 22	13.68	25.56	77.6	1.14	5
February	78.08	91.22	64 40	15 30	26.82	74.2	0.39	3
March	80 42	93.74	65.30	15.48	28.44	71.8	0.73	3
April	83.12	95.90	69.44	16.02	26.46	70.7	1.12	4
May	83.84	96.98	72.86	12.60	24.12	76.7	4.00	9
June	82.40	95.00	72 68	10.80	22.32	81.4	9.75	16
July	80.96	92.30	72.32	9.00	19.98	84.8	15.00	21
August	80.96	91.40	72.14	8.64	19.26	84.8	14.22	21
September	80.78	91.94	72 32	8.28	19.62	85.5	14.75	20
October	80.60	91.94	70.52	10.08	21.42	82.7	7.55	16
November	79.16	89 96	68.54	10.26	21.42	82 0	5.37	12
December	77 36	89.78	64.94	11.16	24.84	80.7	2.29	8
Year	80.42	92.48	69.08	11.70	23.40	79.4	76.31	138

[1] From observations covering the period 1883–1902.
[2] " " " " " 1865–1902.

The normal monthly average relative humidity in Manila ranges from 70 to 85 per cent., with a normal average of less than 80 per cent., is lowest during the hot, dry season, when high temperature prevails, and highest during the rainy season, when more moderate temperature prevails. The quantity of water vapor in the atmosphere thus affects the diurnal and yearly ranges of temperature, and particularly the "sensible" temperature. Air saturated with moisture feels hotter than the thermometer actually indicates, and if near the body temperature the cooling process by evaporation is completely checked.

Besides the amount of humidity in the atmosphere, "sensible" temperature depends upon many other factors, important in the Philippine Islands, not entering into temperature as recorded by the thermometer—viz., movements of air, exposure to direct rays of the sun, reflected heat, one's physical and mental condition, clothing, occupation, food, etc., variations in which tend to produce comfort or discomfort. These factors are given detailed consideration in another part of this paper.

On the following page is given a comparative table between the United States weather districts and Manila, with respect to humidity and precipitation:

Districts.	Relative Humidity.							Precipitation.						
			Departures.							Departures.				
	Normal	1903	1903 from U. S. normal	1903 from Manila	1903 from Manila normal	U. S. normal from Manila 1904	U. S. normal from Manila normal	Normal	1903	1903 from U. S. normal	1903 from Manila	1903 from Manila normal	U. S. normal from Manila 1904	U. S. normal from Manila normal
New England	77	77	0	+ 2.2	— 1.6	— 2.5	— 1.6	43.0	38.7	— 4.3	— 1.9	— 36.9	— 41.0	— 32.6
Middle Atlantic	74	74	0	— 0.8	— 4.6	— 5.5	— 4.6	43.8	43.8	0.0	+ 3.2	— 31.8	— 40.2	— 31.8
South Atlantic	77	76	— 1	+ 1.2	— 2.6	— 2.5	— 1.6	52.0	47.6	— 4.4	+ 7.0	— 28.0	— 32.0	— 23.6
Florida Peninsula	79	78	— 1	+ 3.2	— 0.6	— 0.5	+ 0.4	51.0	48.1	— 2.9	+ 7.5	— 27.5	— 33.0	— 24.6
East Gulf	75	76	+ 1	+ 1.2	— 2.6	— 4.5	— 3.6	56.0	49.0	— 7.0	+ 8.4	— 26.6	— 28.0	— 19.6
West Gulf	74	74	0	— 0.8	— 4.6	— 5.5	— 4.6	43.2	38.2	— 5.0	— 2.4	— 37.4	— 40.8	— 32.4
Ohio Valley and Tennessee	72	73	+ 1	— 1.8	— 5.6	— 7.5	— 6.6	45.2	37.4	— 7.8	— 3.2	— 38.2	— 38.8	— 30.4
Lower Lakes	74	76	+ 2	+ 1.2	— 2.6	— 5.5	— 4.6	35.4	35.3	— 0.1	— 5.3	— 40.3	— 48.6	— 40.2
Upper Lakes	77	76	— 1	+ 1.2	— 2.6	— 2.5	— 1.6	32.2	31.6	— 0.6	— 9.0	— 44.0	— 51.8	— 43.4
North Dakota	72	72	0	— 2.8	— 6.6	— 7.5	— 6.6	18.9	21.3	+ 2.4	— 19.3	— 54.3	— 65.1	— 56.7
Upper Mississippi Valley	72	74	+ 2	— 0.8	— 4.6	— 7.5	— 6.6	34.3	33.8	— 0.5	— 6.8	— 41.8	— 49.7	— 41.3
Missouri Valley	69	72	+ 3	— 2.8	— 6.6	— 10.5	— 9.6	28.7	32.2	+ 3.5	— 8.4	— 43.4	— 55.3	— 46.9
Northern Slope	61	68	+ 7	— 6.8	— 10.6	— 18.5	— 17.6	22.4	22.6	+ 0.4	— 18.0	— 53.0	— 61.8	— 53.2
Middle Slope	62	66	+ 4	— 8.8	— 12.6	— 17.5	— 16.6	22.2	22.0	— 0.2	— 18.6	— 53.6	— 61.8	— 53.4
Southern Slope	62	64	+ 2	— 10.8	— 14.6	— 17.5	— 16.6	23.2	28.4	+ 0.2	— 17.2	— 52.2	— 60.8	— 52.4
Southern Plateau	39	39	0	— 35.8	— 39.6	— 40.5	— 39.6	10.2	9.3	— 0.9	— 31.3	— 66.3	— 73.8	— 65.4
Middle Plateau	50	53	+ 3	— 21.8	— 25.6	— 29.5	— 28.6	11.3	8.5	— 2.8	— 32.1	— 67.1	— 72.7	— 64.3
Northern Plateau	62	63	+ 1	— 11.8	— 15.6	— 17.5	— 16.6	15.6	12.7	— 2.9	— 27.9	— 62.9	— 68.4	— 60.0
North Pacific	80	80	0	+ 5.2	+ 1.4	+ 0.5	+ 1.4	51.9	48.7	— 3.2	+ 3.1	— 31.9	— 32.1	— 23.7
Middle Pacific	71	69	— 2	— 5.8	— 9.6	— 8.5	— 7.6	29.4	24.0	— 5.4	— 16.6	— 51.6	— 54.6	— 46.2
South Pacific	68	68	0	— 6.8	— 10.6	— 11.5	— 10.6	14.5	10.3	— 4.2	— 30.3	— 65.3	— 69.5	— 61.1
	Normal (1)	1903		Manila 1903 from normal		Manila 1904 from normal		Normal (2)	1903		Manila 1903 from normal		Manila 1904 from normal	
Manila	78.6	74.8		— 3.8		+ 0.9		75.6	40.6		— 35.0		+ 8.4	

[1] From observations covering the period 1888–1904.

[2] From observations covering the period 1865–1904.

The following is a comparative table with respect to temperature, humidity, and precipitation between Manila and five other tropical cities in the Far East:

City.	Latitude.	Temperature.			Relative humidity.	Rainfall.	
		1901. Max. mean.	1901. Min. mean.	Annual normal.	Annual normal.	Annual normal.	Rainy days.
Singapore . .	N. 1° 17′	86.7	74.3	79.90	80.0	93.22	174
Rangoon . .	N. 16 46	89.3	72.7	79.06	87.0	98.89	116
Calcutta . .	N. 22 23	86.3	70.7	77.85	82.0	60.83	85
Bombay . . .	N. 18 58	85.5	74.7	79.88	78.0	82.72	76
Batavia . . .	S. 6 8	82.9	73.0	78.80	82.8	71.15	156
Manila . . .	N. 14 35	88.2	72.1	80.40	78.6	75.61	138

As early as 1797 Heberden, and later in 1863 Scoresby-Jackson, conducted investigations in England and Scotland, respectively, on the influence of cold on health, and reached the conclusion that "mean temperature and mortality from all causes had an inverse relationship below 50° F."

From the investigations of Buchan, Mitchell, and Pettenkofer, the following general propositions were deduced:

"1. A preternaturally dry air, with a high temperature, predisposes to the development of fevers and intestinal diseases.

"2. A very moist atmosphere, accompanied by a low temperature, is likely to induce bronchial and rheumatic affections.

"3. In summer and autumn the tendency to sickness and death is chiefly connected with the digestive organs.

"4. In summer and autumn a rise of mean temperature above the average increases the number of cases of and mortality from diseases of the digestive organs.

"5. A cool and rainy summer controls the prevalence and fatality of diarrhœal diseases."

The effects of temperature in producing disease are often confounded with the change of temperature, the latter of which is, perhaps, the more important of the two.

The literature with reference to the effects of tropical climates upon the human body appears to be even more exhaustive than that applicable to the temperate zone.

It has been shown that the presence or absence of vegetation affects temperature, and that the condition and character of soil have an important relation to health, the influence of which is exerted mainly through the media of water and air.

Twenty years ago Parkes defined the effects of climate upon the human body to be "the sum of the influences which are connected with the solar agencies, the soil, the air, or the water of a place," and stated that: "The deaths in the West Indies were partly owing to the virulence of yellow fever . . . and the general excess of

other febrile and dysenteric causes. The simple precautions which are efficacious in England have been as useful in the West Indies. Proper food, good water, pure air have been supplied, and, in proportion as they have been so, the deadly effects attributed to climate have disappeared. The effect of a tropical climate is, so to speak, relative. . . . Take away these sanitary defects, and avoid malarious soils or drain them, and let the mode of living be a proper one, and the European soldier does not die faster in the tropics than at home."

Billings, writing at that time, and Williams at a later period, expressed substantially the same views.

Some authorities take the view that in certain portions of the tropics and under favorable conditions, acclimation is possible; this group includes Quatrefages, Bertillon, Treille, van der Berg, Overbeck de Meyjer, Schellong, Daübler, and Koch. Daübler says that "Health in the tropics depends upon tropical hygiene and ethnic adaptability or acclimation, the manner of living playing the most important role." Stockvis and Below say without qualification that adaptation of Europeans to conditions in the tropics is possible.

It is admitted that colonization has been successful in Queensland, Australia, lying between the parallels of fifteen and twenty-eight degrees, south latitude, a region partly tropical and partly subtropical, which increased in white population from 28,000 in 1856 to 343,000 in 1886. Queensland has as low a rate of mortality as Europe.

Daübler concluded that European colonization has been successful in certain subtropical and bordering tropical regions. Virchow, Carey, Cosales, and Stanley give statistics in which they state that the European may, under proper sanitary conditions, transplant himself anywhere. Thomas says: "Under the tropical skies the climate is not an obstacle. The soil remains the only enemy we have to conquer." As to whether vital energy is sustained in the tropics, Stockvis says: "Not only is European acclimation in the tropics possible, but also full colonization," his statement being based on "results of exact observations in the laboratory at Batavia, as well as upon statistics of European colonization in South America." Felkin was able to conclude from his observations in Africa that "The adaptation of the white race to a tropical climate is possible," and Calvert concludes that it is practicable.

Nevertheless, the proposition early laid down that it is impossible for the white race to adapt itself to a tropical climate is supported by Lind, Saulnier, Divivier, Boudin, Helfft, Hirsch, and Rower. Munson expresses similar views, but states that "It is not at all easy to say how much of the excess of mortality of Europeans in tropical and subtropical countries over that of the natives is simply attributable to climate *per se*, and is consequently inevitable, or how much of it is the direct consequence of unsuitable habits of life and of the

neglect of sanitary laws and of personal hygiene." Munson's statement to the effect that there is an excess of mortality among Europeans in tropical and subtropical countries over that of the natives does not appear to be borne out with respect to the Philippine Islands by the last published report of the Board of Health, which shows the death rate in Manila for the twelve months prior to September 1, 1903, as follows: Filipinos, 43.42 per cent; Chinese, 28.26 per cent.; foreigners, 18.72 per cent.; Americans, 14.80 per cent. Excluding cholera, the death rate for Americans for the same period was only 3.83 per cent. The comparative death rate of natives in the army seems to corroborate the report of the Board of Health in this matter. While it is true that the native is less susceptible to a few diseases than is the white race, the evidence is cumulative that the rate of mortality among the white race now living in the tropics is less than that of the native population.

Conclusions as to the unhealthfulness of tropical climates appear to have been drawn principally from statistics relating to military organizations, and proper consideration does not appear to have been given to the fact that in many parts of the tropics colonies of representatives of Northern as well as of Southern Europe have lived for years or for generations in comparative health and comfort in India, in the straits settlements, in the East Indies, and in the West Indies. This statement is amply verified in the history of cities of Southern Asia, including Bombay and Calcutta, and of the islands of the East Indies, including Manila.

Referring to the problem of the relations of climate to health, Calvert sagely observes that "Statistics of military operations possess practically no value in an inquiry of this nature, for troops campaigning in any country are most liable to diseases."

The classical proposition that a white man cannot adapt himself to a tropical climate appears to be based partly on the experience gained in former times through exploration and attempts to colonize in the tropics. The results were generally disastrous and have not been forgotten, being constantly referred to as conclusive evidence of the impossibility of colonization by the white race in the torrid zone. Disease and death invariably accompany the invasion of an army into any country, whether it be in the temperate or in the torrid zone. It is likewise true that, while great heat is borne by the system if the body temperature is kept down by abundant perspiration, and if the hot season is not of long duration, protracted residence in a region of *great* or *intense* heat appears to exercise a depressing influence, "lessening the nervous activity and impairing the great functions of digestion and respiration and sanguification and probably the power of forming new and healthy tissue." There are many parts of the tropics, however, where the heat is not intense at any period of the year, or where the season of intense heat is not of long duration, in which the evidence is cumulative that the white

race can live for an extended period without forfeiture of health or longevity. In the tropics there has been a steady decrease in the amount of illness and in the death rate among Europeans in the colonial possessions of the British, Dutch, and French. There has been no material change in the climate either of the temperate zone or of the tropics. As the climate has not materially changed, the reduction many fold in the amount of illness and the mortality rate must be accounted for largely by the observance in the tropics of the hygienic measures of modern times which obtain in the temperate zone.

There has been improvement in health conditions in the United States, just as there has been more recently in the tropics, with improvement in hygienic living and surroundings. A portion of the tropical world will probably continue to be unhealthful for Europeans until there can be observance of the rules of personal, domestic, and public hygiene. Insular and other portions of the tropics, where the temperature, relative humidity, and soil conditions are favorable are not shown to be essentially unhealthful.

For the period prior to 1900 there are "no statistical records of sanitary value" available for comparison of health conditions in the city of Manila or the Philippines. The report of the Commissioner of Public Health for the year ended August 31, 1903, shows a steady improvement in general health conditions. Excluding cholera, which the Commissioner states "is to be regarded as an exotic in the Philippine Islands," the *general* mortality rate decreased from 39.66 per cent. in 1900 to 29.45 per cent. in 1903. The death rate among Americans of 3.83 per cent. for the same period and of 1.82 per cent. for the year ended August 31, 1904, were very much lower than the *general* mortality rates in Manila or most cities in the temperate zones. The American population, however, does not include the usual proportion of old and young persons, and some have returned to the United States on account of illness. From the best information obtainable, the mortality rates of infants and of old people among the whites are not greater than those in the United States, and the death rate of those who returned to the States is very low.

The mortality of infants under one year of age among the natives is shown to have been 40 per cent. of the total number of deaths and to have exceeded "the combined mortality of Asiatic cholera, bubonic plague, smallpox, dysentery, malarial fever, typhoid fever, and beriberi." Attention is called to the fact that the *general* death rate in Ermita district, where reside a larger proportion of whites than in other districts of Manila, was 19.22 per cent., "about the same as that of the best modern cities." The excessive infant mortality among *natives* is due to the lack of proper care and food. The health reports show that of the total number of deaths in the city of Manila, approximately one-half occur "in the absence of any treat-

ment of a qualified physician." The high death rate among the natives appears to be largely independent of climatic influences, and accounts for the islands being so sparsely inhabited. The population of Java (area 51,961 square miles), with similar climatic conditions, increased from about 17,291,000 in 1872 to 24,133,685 in 1891, while the population of the Philippines, with an area of 127,863 square miles, more than double the area of Java, is approximately 7,000,000, an increase since 1887 of only about 1,000,000.

With respect to cholera, smallpox, malaria, and beriberi, the Commissioner of Public Health states:

"The Filipinos have been not only more liable to contract cholera than the Chinese or Americans, but, when they do get the disease, they are almost twice as liable to die therefrom. The number of Americans who contracted the disease is unduly high; but the cases occurred largely among soldiers who entered native houses and partook of native foods and drinks in defiance of standing military orders.

"During the twelve months prior to September 1, 1903, there were 99 cases of smallpox in Manila, with 16 deaths, or no more than occur from this cause in various cities of the United States of equal size having a large dark-skinned population.

"Malarial disease is by no means as common or dangerous in the Philippines as in many other parts of the tropics.

"Whites are relatively very insusceptible to the disease (beriberi) and but few cases occur among them."

Notwithstanding the unfavorable sanitary and hygienic conditions, statistics of the Board of Health show, by comparison of death rates for other cities, that Manila in 1903 was more healthful than were in the preceding year or two Bombay and Calcutta, and compared favorably with Hongkong, Moscow, Trieste, Naples, Madrid, Cairo, Alexandria, New Orleans, Charleston, Memphis, and other cities in the temperate zone.

Referring to the health of the army, the Surgeon-General states: "The sanitary improvements in the conditions of the soldiers have gradually lessened the rates of sickness and mortality since the war, and, although a large proportion of the troops have been on practically war service in the Philippine Islands since 1898, the rates of sickness and mortality for the calendar year 1903 more nearly approach those of 1897, when the low death rate of 5.11 per thousand of strength for the whole army was recorded, than at any time since the outbreak of the Spanish-American war. This is a most gratifying state of affairs, and it is hoped that with the present sanitary knowledge put to practical energetic use a further reduction in the rates of sickness and mortality in the army will be effected."

Commenting on discharges for disability, the report of the Surgeon-General states: "It is true that with the most rigid examination some physically unfit men will be accepted. It is believed, however,

that one-third of the recruits who were afterward discharged for disability during the year 1903 should have been passed physically."

The statistics of the Surgeon-General's reports do not give complete and exact data as to the comparative health conditions between American soldiers in the United States, American soldiers in the Philippines, and native soldiers in the Philippines. From information contained in the reports, however, it is inferred that while the amount of sickness in the islands among American soldiers and native soldiers is about the same, the mortality rate of the natives is higher than that of the Americans, and that at no equal period of time has the mortality rate on account of sickness in the Philippines been as high as it was during the Civil War or during the Spanish-American war.

Asiatic cholera, yellow fever, dysentery, malarial fevers, and their sequelæ, which have occurred extensively in the United States and elsewhere in the temperate zone, as well as in the tropics, are not the destroyers of former times. Yellow fever is not a factor in the health problem of the Philippines, and Asiatic cholera is now nonexistent in the islands.

As to malaria in tropical regions, the worst forms exist in Central America and along the banks of rivers and in great river deltas of Africa and South America. It is common in India, Southern China, and in most parts of the East Indies, rare in Japan, Australia, New Caledonia, some of the South Sea Islands, and practically unknown in the Hawaiian Islands, Samoa, and New Zealand. In Manila and the greater portion of the Philippines, where Americans are required to live, malaria does not seriously affect the health of the white man who observes the reasonable hygienic measures which are required to be free from this disease during part or all of the year in many portions of the United States. The difference between the care of troops in modern times and formerly is illustrated by an instance in Ceylon, where in former times it is shown that at a certain station out of a total strength of 254 men all contracted malarial fever and 205 died; whereas the admissions for this disease in Ceylon in 1898 were only 71 per thousand.

Dysentery and other intestinal diseases in the Philippines are becoming less frequent in proportion as there is increased observance of domestic hygiene. The important diseases which are limited to the tropics are few. The great proportion of the decimating diseases have been more or less common in both the tropics and the temperate zones. As increased temperature and humidity, however, favor putrefactive changes and the growth and development of micro-organisms, some diseases are more prevalent in the tropics than elsewhere. On the other hand, sunshine, with little moisture and periodic heavy rainfall, are health-promoting agencies. In the

greater part of the Philippines, as in the greater part of the United States, the question of climate in its relation to health appears to resolve itself principally into the ability of man to circumvent disease through sanitary and hygienic measures.

It has been demonstrated in the Philippines that bubonic plague can be controlled by preventive measures, although it is an extremely fatal disease, as is cholera. Fortunately, however, comparatively few Europeans in the Philippines were attacked by cholera during its recent visitation, and fewer still by bubonic plague, only those suffering from disease whose manner of living is most unsanitary or who fail to observe reasonable hygienic precautions.

Of three great ravaging diseases in the United States—viz., tuberculosis, enteric fever, and penumonia—tuberculous cases among Americans in the Philippines are less frequent than in the United States, and enteric fever and pneumonia are comparatively rare. In Manila for the year ended August 31, 1904, but two deaths occurred from enteric fever and two from pneumonia among the European or foreign population.

The greatly increased amount of sickness and death from intestinal diseases during the hot season in the United States, and from respiratory diseases on account of the cold, damp, and changeable weather of the winter and spring seasons, together with many diseases which are rare or unknown in the Philippines, but prevalent in the United States, are important considerations when comparing the healthfulness of the climate of the Philippines with that of the United States.

Among the more or less prevalent diseases in the United States which appear to be comparatively rare or unknown in the Philippine Islands are gout, rheumatism, rheumatoid arthritis, neuralgia, cancer, enteric fever, relapsing fever, rubeola, scarlatina, diphtheria, rabies, and nearly all diseases of the respiratory system.

The character of dwellings with respect to structure, arrangement, and sanitary features is important from the standpoint of health and comfort. A house cannot be said to be in a hygienic condition which is so constructed as to prevent the sun's rays from reaching every portion of the interior when desired. An old Italian proverb has it, "Where the sun does not enter, the physician will."

In a tropical climate a house properly constructed and located, with a sufficient space around it to ensure free circulation of air, will have at any time of day or night some portion comparatively cool and comfortable. As the relative humidity of the air is greater near the surface of the earth during the night, when the temperature is at or near the daily minimum, approaching the dew point, dwellings in the tropics should be so constructed that the sleeping rooms are as far above the ground as practicable. A considerable proportion, approximately one-third, of the volume of soil consists of air. It is

a common occurrence in the Philippines to observe a house built on damp soil with the subsoil water near the surface, a depository of organic matter, the inhabitants being subjected to the emanations from the soil, especially at night, through open floors, putrefaction being active in the soil.

While the so-called "miasma" and "effluvia" possess little value as definite etiological factors of disease, the high specific gravity of certain noxious gases renders their presence in the air, as well as that of organic matter, harmful to those who sleep upon or near the ground.

In the tropics especially, in addition to a proper sewage system, a sanitary abode seems to require good drainage, elevation, with the ground under and immediately around the house surfaced with concrete or other impervious material, tight floors, and thorough ventilation. The prevailing absence in the Philippines of these sanitary conditions is an important etiological factor of disease, closely allied to medical climatology, and is entitled to careful consideration in any discussion of climate in its relation to health.

As the surroundings of a dwelling should lend much to health and comfort, the ground should slope away from the house, carrying all surface water to a distance, and the intense light of the dry season be softened by the presence of lawns and shrubbery around the dwelling. A pleasing landscape with the soothing influence of its predominating color of green appears to have been regarded as of very little importance in Manila. It is unfortunate that in these islands, where the benefits of plant life are so easily obtainable with a minimum of effort, there are not more habitations surrounded by lawns and flower gardens.

Medical climatology also involves the matter of a pure and abundant water supply, which is an important factor in the healthfulness of any locality. Because of the pathogenic organisms which water frequently contains, many refrain from drinking a sufficient amount of wholesome water and incline to the excessive use of alcoholics. Hydrotherapy in the tropics seems to be particularly appropriate. It appears to be the concensus of opinion among medical men that, as a rule, the *quantity* of pure, wholesome water is of more value than the medicinal virtues of the water of this or that mineral spring. The frequent excessive use of alcoholics and the tendency to abstain from drinking water on account of the danger of contracting disease thereby has claimed the attention of investigators.

Wulffert, of Berlin, describes the effect of alcohol in the tropics upon the digestive organs, nervous system, and the heart, and comes to the conclusion that these organs are hampered by its use in their effort at adaptation to the hot climate, regulation of bodily heat being disturbed, excessive perspiration induced, and the organs weakened as to power of overcoming disease. Similar conclusions

are reached by other physicians, among them being Fiebig, Rudel, Anschutz, Schwalbe, and Breitenstein. Fiebig states that of 40 cases of "black-water fever" which he treated in the tropics, all were alcoholics. From his investigations, Wulffert concludes that the obstacles which oppose acclimation are those which are presented by local conditions; example, malaria, and those which lie in the colonizer himself; example, the alcohol habit, and that "a white people addicted to the alcohol habit can never hope to settle tropical countries," and recommends as preparatory measures for life in the tropics:

"1. Vigorous bodily work or sport in the open.

"2. The use of the system of diet recommended for the tropics by Rubner, a system which he considers as not unsuitable also to the temperate zone.

"3. Complete abstinence from intoxicating liquors."

Referring to the prevalence of alcoholism, Munson states: "In the military service the abuse of alcoholic liquors is one of the most potent factors by which efficiency is impaired, and in the past its effects were so apparent that drunkenness was largely looked upon as a distinctively military failing. Its influence as well as its prevalence is indifferently shown by military statistics; for all drinking men do not enter hospitals for alcoholism, and a certain proportion of drunkards succumb to such various diseases as gastritis, cirrhosis of the liver, and nephritis, in the development and ultimate result of which the use of intoxicants has probably played no minor part; further, the term alcoholism includes many pathological conditions and their symptoms, these varying according to the quantity of alcohol taken and the manner in which it is consumed."

In a climate like that of the Philippines there is little excuse for being deprived of an abundance of air in-doors, or for overcrowding and little ventilation. The conditions are favorable to living practically in the open air night and day.

Even in the time of Hippocrates the stated laws of health recognized a proper relation between food and drink and exercise, expressed by the formula, "temperance and exercise."

The climate of the Philippines is favorable, in that exercise can be taken practically in the open air at all times of the year, where properly constructed and healthful habitations are available. Abnormal physiological function in the tropics is believed to be due largely to the lack of physical exercise.

Parkes estimates that "every healthy man ought to take daily an amount of exercise equivalent to 150 tons lifted one foot, or a walk of about nine miles," which is practically equivalent to the average demands of a majority of trades and manual occupations.

In addition to shelter and surroundings, the influence of climate is further modified by the appropriate use of food and clothing.

Climatic conditions appear to be more favorable in the Philippines than in the temperate zone for the observance of the hygiene of clothing.

Notwithstanding the climate of the Philippines is commonly referred to as enervating, Americans connected with the public service, whether engaged upon work in offices or upon work requiring their presence in the open air, have probably on the average accomplished more in the islands than is ordinarily accomplished at home in similar lines of work. Regular habits, the leading of a temperate life, and the absence of indulgence in excesses, have much to do with one's health in any country. The climate of these islands should not be held responsible for illness or physical breakdown due to those excesses which tend to physical demoralization in the temperate zone. Absence from home environment and restraints probably accounts for a large number of Americans who, by plunging into excesses of various kinds, caused their own physical demoralization and failure.

It should be remembered that there is no place, even in the temperate zone, suitable for and agreeable to all persons. There are so great a variety and so many degrees of physical obliquity that no single combination of climatic influence, however favorable, can be found to meet all conditions. Because the climate of the Philippine Islands does not agree with some, even who take reasonable care of themselves, does not necessarily indicate that the climate is unhealthful. The physical condition of many improves after coming to the islands, and that of others remains normal.

As a general rule, the appearance of Europeans living in the tropics seems to indicate an anæmic condition. The "cry of the system for better blood," expressed in the form of neuralgia, is, however, rare. In this connection Cabot states: "The most striking example of the fallacy of judging of anæmia by the color of the skin and mucous membranes is the so-called 'tropical anæmia.' Practically all persons belonging to white races who take up their abode in the tropics acquire, after a term of years, an extreme pallor of the skin and mucous membranes, and this appearance has usually received the title of 'tropical anæmia.' It turns out, however, from the careful studies of several different investigators, that the blood of such persons shows absolutely no anæmia or other variation from the normal. The appearance of the skin is probably due to the action on the peripheral nerves and vessels. Tropical anæmia is a condition not of the blood, but of the skin and subcutaneous tissues." These views are confirmed by the more recent studies of Phlen, Marestang, Gringus, and Eijkmann. Gottstein concludes that "as a result of long residence in the tropics neither a quantitative change of the blood nor a reduction in the number of its cells or its hæmoglobin-content takes place." These conclusions are verified

by the following results of examinations recently made by Mr. M. T. Clegg, under the direction of the Acting Superintendent of Government Laboratories, of twenty-three employés of the Philippine Civil Service, selected at random, who have been continuously in the Philippine Islands for over four years:

Age.	General health.	Continuous residence (years).	Weight on arrival.	Weight at present	No. of red blood corpuscles per cent. c.m.	Specific gravity of blood.	Hæmoglobin estimate per ct.	Color index
27	Feeling of debility during past three months	4¼	128	152	5,000,000	1060	100	1
32	Has feeling of debility at times	6	140	150	5,000,000	1060	100	1
33	Good	5½	155	150	4,800,000	1060	100	1
28	Has had typhoid fever and dysentery	6½	160	210	5,000,000	1060	100	1
33	Has had dengue	6	157	197	5,000,000	1060	100	1
34	Has had dysentery	6	158	123	4,000,000	1056	80	1
30	Has had typhoid	5½	137	135	5,000,000	1060	100	1
30	Malarial fever (1900)	5½	170	175	4,500,000	1056	80	0.9
30	Good	5½	160	172	4,800,000	1059	95	1
32	Good	6	180	160	5,000,000	1060	100	1
25	Good	6	160	150	4,500,000	1059	95	1
28	Fair	6½	132	134	4,500,000	1056	80	0.9
34	Good	5½	148	148	4,800,000	1059	95	1
30	Good	5¼	156	148	4,500,000	1059	95	1
38	Good	6	126	142	4,800,000	1059	95	1
33	Good	6	178	164	5,000,000	1060	100	1
33	Good	4⅓	170	182	5,000,000	1060	100	1
28	Good	6	140	135	4,800,000	1059	95	1
33	Good	6	145	154	4,500,000	1057	85	0.95
31	Good	6½	155	155	4,800,000	1059	95	1
...	Eight days with cholera	4⅙	157	186	5,000,000	1060	100	1
...	Good	6⅚	120	145	5,000,000	1060	100	1
28	Good	6 7/12	185	156	4,800,000	1059	95	1
30.9	Average	5.8	152.9	157.5	4,786,956	1059	95	

NOTE.—Hammerschlag's method was used in estimating specific gravity and hæmoglobin.

Cantlie observes that about two years are required for acclimation of the white man in the tropics, after which good health is a reasonable expectation. Calvert makes a similar observation. These views seem to be borne out by statistics of the Board of Health of the Philippines,[1] which show the general average of sick days per year for five years for each American employé connected with the Civil Service of the Philippine Government as follows: First year, 4.80; second year, 7.63; third year, 4.47; fourth year, 0.81; fifth year, 0.03. Further corroboration is found in the following reported by Marston, showing the death rate of British white troops in India per thousand, based upon statistics for a period of eight years prior to and including 1884: First and second years of service, 6; third to sixth years of service, inclusive, 1.88; seventh to tenth years of service, inclusive, 0.73.

[1] Results of a Preliminary Study of the Health of Americans in Manila.

The period of foreign service of the United States Army being two or three years, appears to cover practically the usual period of acclimation. The conclusion appears to be reasonable that the fourth and fifth years of residence in the Philippines are more agreeable from the standpoint of health than any of the preceding years, as is indicated by the Board of Health statistics, a large proportion of the personnel of the Philippine Civil Service having been recruited from officers and enlisted men of the volunteer establishment of the army. The views expressed by the president of this Medical Association, Dr. McDill, in his annual address, are in accord with conclusions reached by other observers.

The influence of the climate of the Philippines from a surgical point of view is clearly expressed by Major J. M. Banister, of the Medical Corps of the Army, in the following propositions:

"1. Aseptic results will just as surely follow aseptic methods in the Philippines as in the United States or Europe.

"2. Should septic infection occur in any clean case subjected to operation in the Philippines, blame the technique, not the climate.

"3. Successful attainment of the object for which the operation has been undertaken will follow careful and skilful surgery in the Philippines with the same regularity that we have been accustomed to observe in such work at home.

"4. Convalescence after surgical operations in the Philippines is rapid and satisfactory when such operations have been carefully and skilfully performed.

"5. The danger of mortality after a skilfully performed surgical operation in which all the details of a rigid aseptic technique have been carried out is not increased by the influences of the climate of the Philippines unless the patient is at the same time the victim of some other serious disease."

Similar views are expressed by the Attending Physician and Surgeon, Civil Hospital, in his report submitted in 1903 to the Secretary of the Interior.

Major-General Wood, Governor of the Moro Province, in his annual report to the Governor-General, states: "There is nothing in the climate of this portion of the island which prohibits a long residence here. The British residents of North Borneo and the Malay Peninsula and the Dutch in Java manage to live apparently very contented and healthy lives in those countries, which are hotter than any portion of the Philippine Islands. While the service is in a way severe, it does not seem to deter the average Englishman or Dutchman from competing eagerly for positions in the government of the colonies, and it is believed that Americans can live and do good work where any other white race can. A moral life, with plenty of hard work, will be found to counteract in most cases the so-called demoralizing effects of the Philippine climate."

The revelations of bacteriological research of the last few years, arming men with a knowledge of the causative factors of many tropical diseases, have diminished the importance of their geographical and meteorological relations, have destroyed theories of the climatic origin of disease, and thereby robbed the tropical climate of many of its terrors, such as yellow fever, malaria, Asiatic cholera, and dysentery. Among Americans the late lamented Major Walter Reed and his coadjutors did monumental work along this line in Cuba and the Army Laboratory at Washington. The preliminary work of the bacteriologists and pathologists connected with this magnificent and splendidly equipped new laboratory[1] in the Far East gives every indication that the research work already inaugurated will show brilliant results and add new names to the long list of investigators whose work and discoveries in the field of preventive medicine deserve the gratitude of the whole world.

CONCLUSIONS. 1. With respect to the principal climatological factors, temperature, humidity, and atmospheric movements, the climate of the Philippine Archipelago is not extreme, as it is distinctly insular in character, the greater portion of the land area being not far distant from the ocean. There are other modifying influences which obtain in portions of the archipelago, such as general oceanic and local interisland currents, prevailing winds, elevation, the state of cultivation and drainage of the soil, and the presence of forests and other plant life.

2. Excluding localities in the tropics characterized by excessive heat, high relative humidity, or unhealthful soil conditions, acclimation or physiological adaptation of the white man to tropical environment is possible.

3. If acclimation is possible, colonization is possible.

4. Failures of the white race to live in the tropics and maintain health, excluding localities indicated in the second conclusion, appear to have been due principally to non-observance of the rules of personal, domestic, and public hygiene.

5. As a rule, Americans appear to become acclimated in the Philippines during the third year of residence.

6. With sanitary surroundings and by observing the rules of personal and domestic hygiene, residence of Americans in the Philippine Islands appears to be attended with as little danger of disease and death as residence in the United States under similar sanitary conditions.

[1] The second annual meeting of the Philippine Islands Medical Association was held in the new Laboratory Building of the Bureau of Government Laboratories in Manila.

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REVIEWS.

THE MODERN MASTOID OPERATION. By FREDERICK WHITING, A.M., M.D. Philadelphia: P. Blakiston's Son & Co., 1905.

THIS work is by far the most important publication which has appeared in the English language upon the mastoid operation. Its distinguished author has had such a vast experience that anything which he may write must command the respectful attention of those doing otological work. The book begins with a very interesting medical *résumé*, in which it is pointed out that the history of the mastoid operation is divided into two chronological periods, the first stage beginning when Rolfinck, in 1656, propounded the suggestion that the mastoid process might be artificially perforated, and the second period of the modern mastoid operation beginning in 1864, when Turnbull and Crosby in America and Ludwig Mayer in Germany each perforated the mastoid cortex for the relief of permanent mastoid process. The first suggestion for the operation was that the opening might serve as a means of relief in cases of deafness with excessive tinnitus, the idea being that an artificial vent thus formed might provide an "avenue for the escape of tumultuous noises." The author then proceeds to the history of the Schwartze operation, and concludes his historical *résumé* with a sketch of the development of the modern complete mastoid operation.

The second and by far the largest part of the book is comprised under the heading "Technical Portion." In it the author goes into the most minute detail as to the method of performing the operation, and the subsequent treatment of the operation wound. What he terms the complete mastoid operation differs from the Schwartze operation in two important particulars. First, that in order to provide for the complete removal of the mastoid apophysis it is necessary to perform a flap operation in making the incision through the skin, and, second, in the complete mastoid operation the pneumatic process and the diploic cells at the posterior root of the zygoma are entirely removed. The latter he considers a most essential measure. The description of the operation comprises many pages, and goes into every point which can be imagined in connection with it. The author's style is dogmatic and only justified by his very great experience and by the manner in which he adduces facts to support his contentions. The most striking features of the book are the illustra-

tions with which it abounds. These are excellently made from a cadaver. The one difficulty about them is that the dissections have been so well and carefully done that the conditions represented are too ideal to be looked for during the performance of an operation upon the living subject. The book is to be regarded as a most distinctly valuable acquisition to American otological literature, and its author is to be congratulated upon it. F. R. P.

LEITFADEN DER ELEKTRODIAGNOSTIK UND ELEKTROTHERAPIE FUR PRAKTIKER UND STUDIERENDE. VON DR. TOBY COHEN, Nervenarzt in Berlin. Mit 6 Tafeln und 39 Abbildungen im Text. Zweite vermehrte und verbesserte Auflage Berlin 1902. Verlag von S. Karger.

THE increased interest in the value of electricity as a diagnostic and therapeutic agent, which has developed in recent years among the medical profession, will make this manual of especial interest. It consists of 158 pages in the text, and seems to be written with the special object of leading the beginner by graded steps from the known to the unknown, yet it is sufficiently thorough to make it of value to the more advanced worker, as a handy reference book. It is mostly a practical work, though the theories for each effect are briefly given.

The plates consist of diagrams showing the muscles of sections of the body, with the most favorable points for application of the electrodes. The general rules governing the therapeutic applications are first given, and this is followed by a description of the special applications. As a whole, it well fills the demands of the practical work of the student and practitioner. G. E. P.

THE AMERICAN YEAR BOOK OF MEDICINE AND SURGERY FOR 1905. A Yearly Digest of Scientific Progress and Authoritative Opinion in all Branches of Medicine and Surgery, etc. Under the editorial charge of GEORGE M. GOULD, A.M., M.D. In two volumes. Volume I., including General Medicine; Volume II., General Surgery. Philadelphia and London: W. B. Saunders & Co., 1905.

As usual this Year Book fully fulfils the promise of its title-page, being a complete digest of the world's best medical literature, with critical comments written by thoroughly competent men in all branches of medicine and surgery. It is impossible to dig out for individual criticism any particular portion of the work; it is only

necessary to say that it should be on the shelves of every man who wishes to keep abreast with the progress of the profession.

F. R. P.

TRAITE D'HYGIENE PROCEDES RAPIDES DE RECHERCHE DES FALSIFICATIONS ET ALTERATIONS. Par le DR. P. SMOLENSKY (De Saint-Petersbourg). Fraduction du russe par S. BROIDO et A. ZAGUELMANN. Annotée par L. GUIRAUD et A. GAUTIE. Avec 119 Figures, pt. 752. Paris: G. Steinheil, editeur, 1904.

OF the 681 pages of actual text which this book contains, 531, or nearly four-fifths, are devoted to foods, the chapters on which contain much that is valuable and much that is useless; and while the police side of the question of food supply is fairly well covered, the hygienic side is very largely neglected and ignored. The chapters on air, water, and soil cover less than a hundred pages and are very sketchy; while the remaining chapters on habitations, lighting, and clothing, covering 50 pages, are of almost no value. The work is hardly a treatise on hygiene, for many of the most important subjects which make up that department of medical science are not touched upon at all. It is really a work on foods, far inferior to many written in our own language, with a few supplementary chapters on subjects which are much better handled in almost any modern work on hygiene.

C. H.

THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY OF LONDON CENTENARY, 1805–1905. By NORMAN MOORE, M.D., F.R.C.P., and STEPHEN PAGET, F.R.C.P. The Aberdeen University Press, Limited, 1905.

THE Royal Medical and Chirurgical Society of London is to be congratulated on the handsome volume in which it has commemorated its centenary anniversary. Its authors are both well known for their researches in the history of medicine, and their labor has evidently been one of love. The book will prove of value, not only as a history of the Society, but for the bibliographical and biographical information it contains concerning practically all the prominent physicians and surgeons who have flourished in London during the past century. There are also many interesting anecdotes and much curious and otherwise buried information about many medical worthies. It is sincerely to be hoped that a publication such as this will have a stimulating effect upon other medical organizations in the direction of preserving their histories and rendering information otherwise lost accessible to those who enjoy research in medical

history. Many interesting anecdotes could be quoted did space permit. There is an interesting account, for instance, in the sketch of Sir Henry Halford on the disinterment of the body of King Charles I., and in the biography of Elliotson it tells why Thackeray affectionately dedicated "Pendennis" to him, and of the disrepute into which he fell during the latter portion of his career. It is a pity that the circulation of a book such as this will, from the nature of its publication, be of so limited character. It could with profit be read by every member of the profession. F. R. P.

UNTERSUCHUNGS- UND BEHANDLUNGSMETHODEN KEHLKOPFKRANKHEITEN. VON DR. THEODOR HERYNG. Berlin: Verlag von Julius Springer, 1905.

PROF. HERYNG is one of the foremost laryngologists of the day, and the present volume will redound yet further to his honor. It may be regarded as an exposition of the most recent views in laryngology, and we know of no work in which they are presented in a more satisfactory manner. The work is divided into four sections. The first deals with methods of examination of the larynx and trachea. The second considers the non-operative treatment of diseases of the parts. The third section describes the various operative procedures practised within the larynx, and the last section deals with the instruments which are used in laryngeal work. There is also a very valuable section on the use of inhalations. One is particularly struck with the handsome illustrations with which the volume abounds. Another point which will make the book of especial value to the non-Teutonic reader is the clear and uncomplicated fashion in which the author presents his facts. The book is a distinct addition to the literature of the subject.

F. R. P.

SANATORIA FOR CONSUMPTIVES. A Critical and Detailed Description, together with an Exposition of the Open-air or Hygienic Treatment of Phthisis. By F. RUFENACHT WALTERS, M.D., M.R.C.P. With an Introduction by SIR RICHARD DOUGLAS POWELL, BART., M.D., F.R.C.P. Second edition. London: Swan Sonnenschein & Co., Ltd. New York: E. P. Dutton & Co., 1902.

To those, both lay and professional, interested in the great and growing subject of the prevention and cure of pulmonary tuberculosis, this book will be found to be invaluable in many ways. The author points out that consumptives, more than people in good health, differ in their powers of reaction, so that no one climate is

suited equally to all cases; that the localities which benefit the more curable cases possess certain essential features in common; and that where these conditions obtain it should be possible to conduct successful treatment. He asserts that neither high altitude, dryness, sunshine, fine weather, nor equable temperature should be regarded as essential, although useful or in certain cases desirable; that cures occur in the most unlikely climates; and that fresh air and medical supervision are more essential than fine climate; but climate must be carefully considered since certain climatic conditions are unfavorable to certain classes of patients. He presents a general review of the most modern methods of hygienic treatment; emphasizes the necessity of intelligent medical supervision of diet, accommodation, travelling, and recreation; discusses sites, grounds, construction, preparation, furnishing, and general sanitation of sanatoria, and the disinfection of sputa, linen, etc.; gives many interesting and valuable facts concerning results of sanatorium treatment, and presents a detailed description of the more important existing sanatoria in different parts of the world. The book is profusely and excellently illustrated. C. H.

MEDICAL PHILOLOGY. Gathered by L. M. GRIFFITHS, M.R.C.S. Eng. Part I., A–E 1. Bristol: J. W. Arrowsmith, 1905.

THIS little book comprises a series of notes on various obscure terms which are not applied in the popular language to medical conditions. We are all more or less familiar with the vulgar words which are used to indicate various portions of the human anatomy or applied to symptoms or ailments, but very few of us are familiar with their character or origin. The subject-matter of the book was published in the *Bristol Medico-Chirurgical Journal* when its author was serving in the capacity of assistant editor of that publication. Dr. Griffiths has rendered a distinct service to the medical profession in republishing them in book form. F. R. P.

PROGRESSIVE MEDICINE. Vol. II., June, 1905. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by HOBART AMORY HARE, M.D. Philadelphia and New York: Lea Brothers & Co.,

As usual this issue of *Progressive Medicine* contains a series of contributions of such varying character as to render it of importance to the whole profession.

The first is by Dr. William B. Coley and deals with hernia. A large amount of space is devoted to hernia occurring in infancy and childhood, a most important and not very well understood subject.

In the second part Dr. Edward Milton Foote presents the surgery of the abdomen, exclusive of hernia. The wonderful advances in this department of surgery render Dr. Foote's work particularly valuable. It is accompanied by an especially large series of fine illustrations.

Dr. John G. Clark contributes a valuable section on gynecology, including a particularly interesting discussion on the subject of spinal anæsthesia.

Stengel, in a lengthy but most important section, gives a thorough study of the recent progress made in diseases of the blood, diathetic and metabolic diseases, and diseases of the spleen, thyroid gland, and lymphatic system.

The volume is concluded by Dr. Jackson's valuable discussion of the recent progress in ophthalmology.

As is always the case, the book is not a mere compilation of the literature, but really presents a series of original articles on the progress of medicine. F. R. P.

THE PRACTICAL MEDICINE SERIES OF YEAR BOOKS. Comprising Ten Volumes on the Year's Progress in Medicine and Surgery. Issued monthly under the general editorial charge of GUSTAVUS P. HEAD, M.D., Professor of Laryngology and Rhinology, Chicago Post-Graduate Medical School. Volume II., General Surgery, edited by JOHN B. MURPHY, M.D., Professor of Surgery, Northwestern University Medical School. Series 1905. Chicago: The Year Book Publishers.

THIS volume of the *Practical Medicine Series of Year Books on General Surgery* gives a most complete *résumé* of the year's surgical literature. As the author states in the introduction he has tried wherever possible "to reproduce extensively a number of articles which treat in an analytical or statistical manner of the pathology or operations of an organ or set of organs, based usually on an enormous or extraordinary experience of an individual which was sufficient to make his statements authoritative." This plan, which the author has followed, we think a most excellent one, as much more can be learned from one article of this kind than from many reports of single cases from different individuals. Nearly one-half of the book is devoted to the "Surgery of the Abdomen," and this chapter would in itself make a most interesting and valuable book. The work as a whole is well written and is a most valuable reference book on recent surgical procedures. C. F. M.

THE HISTORICAL RELATIONS OF MEDICINE AND SURGERY TO THE END OF THE SIXTEENTH CENTURY. An Address Delivered at the St. Louis Congress in 1904. By T. CLIFFORD ALLBUTT, M.A., M.D. London: Macmillan & Co., Ltd., 1905.

PROF. ALLBUTT'S book will be read with pleasure by every physician who is at all interested in the foundation of his art. There are but few of us, unfortunately, whose familiarity with Latin and Greek permit of an intimate acquaintance with the works of the early masters of medicine and surgery, and, even though many of them are accessible in good translations, it is sad to record that the study of their works is almost entirely neglected by their successors. The labors of the distinguished author of this little volume should stimulate the flagging interest in antique and mediæval medical writings. Prof. Allbutt shows so much erudition and so close a familiarity with their work that, although the book is a small one it is evidently the result of years of study and labor. The author narrates the curious way in which medicine and surgery from time immemorial have at one time been closely associated, and at another drifted apart, and the alternation of glorious periods of advance with barren periods of dry rot is told in a delightful style. We are glad that the address is preserved in such a permanent and accessible form. F. R. P.

LA SCROFULE, TERRAIN SEPTICO-PYOHENICQUE HEREDITAIRE OU ACQUIS ET DIATHESE LYMPHOIDE PRE- OR POST-TUBERCULEUSE (MALADIE SYSTEMATISEE DU SYSTEME LYMPHATIQUE ET DE SES DEPENDANCES). Par M. LE DR. PAUL GASTOU, Ancien Chef de Clinique et Assistant de Consultation, Chef de Laboratorie de la Faculté à l'Hôpital Saint-Louis. Paris: O. Doin, éditeur, 1904.

IN this admirable monograph of more than 100 pages, Dr. Gastou sets forth, with great completeness, the modern conception of scrofula—a term which has passed through various vicissitudes of meaning, and for a time bid fair to disappear entirely from the nomenclature of medicine. According to the author's definition, scrofula is a septicopyæmia characterized clinically by the existence of hypodermites, or diffuse, prolonged, multiple suppurations, taking the form in one case of superficial impetiginous suppurations; in another of deep, ecthymatous or nodular abscesses, with engorgement, and sometimes suppuration of neighboring ganglia, and ending by the production of visceral alterations of the infection or sclerotic type, or of the degenerative type, such as fatty or amyloid degenerations.

The scope of the essay is readily gathered from the titles of its three parts: 1. Does scrofula exist, and how is it defined? 2. Refutation of the old conception of scrofula. 3. The modern scrofula.

The subject is one to which Dr. Gastou has devoted years of study, and in its present form his work must be taken as presenting the final word of the modern school, which took its origin in the early studies of Chaumier, published in 1884. Scrofula interests both the dermatologist and the pediatrician, and this monograph is, therefore, a welcome contribution to the current literature of both specialties, the value of which is greatly enhanced by the fine series of thirty-two half-tone reproductions and the four colored plates illustrating histological preparations. T. S. W.

A Text-book of Legal Medicine. By Frank Winthrop Draper, A.M., M.D. (Harvard), Professor of Legal Medicine in Harvard University; Medical Examiner for the County of Suffolk, Massachusetts; Medicolegal Pathologist at the Boston City Hospital; Fellow of the American Academy of Arts and Sciences, etc. W. B. Saunders & Co., 1905.

The term "legal medicine" has the same meaning as "medical jurisprudence," or "forensic medicine." As used by the author, it embraces a discussion of all branches of medical science as applied to the requirements of the law. The preface states that the book is intended chiefly for the use of students of medicolegal subjects. and as well for the practitioner. For the latter it can scarcely be of less value than for the former. It contains advice and instructions for the physician when called upon to appear as a witness, which every practitioner is likely to find opportune. Suggestions are made as to his demeanor, preparation, and rights, whether the proceeding be civil or criminal, whether he be called as an expert or as a witness to fact. Dr. Draper's experience as a medical witness renders him peculiarly qualified to advise.

The State of Massachusetts and several other New England States have abolished the office of coroner. The coroner or coronator is a very ancient officer of the law, and, as his title signifies, had originally to do with matters immediately concerning the Crown. It was required in the earlier days that he should be a knight and that he should maintain his office with fitting dignity. In addition to his familiar duty of holding inquests over dead bodies, his functions included preservation of the peace, inquiry into felonies, treasure trove, wreck, and, in emergencies, the execution of process.

The office has lost much of earlier importance in the communities where it survives. The inquest is the only prerogative now exercised, and, in the larger cities at least, it is conducted in such a manner as does not give great weight to the findings of a coroner's jury. It has been said that in our great metropolis the jury's verdicts are written up before the inquest is held, if it seems probable that questions may be raised concerning the liability of an influential corporation or individual. And it is stated that in other large cities the coroner's jury responds obligingly to the demands of the powers that control the respective municipal governments.

In Massachusetts a district medical examiner has succeeded the coroner. He is appointed by the Governor of the State, and is under bond for the faithful performance of his duties. All cases are now submitted to him, which would previously have been the subject of a coroner's investigation. He reports to a judge of the lowest grade in his district, who thereupon holds an inquest. The judge himself interrogates the witnesses and finds the facts. The subsequent proceedings are of the same nature as formerly.

The author has been medical examiner of the city of Boston, and is also professor of legal medicine at Harvard University. While, as he himself states, the work may be primarily intended for students of medical jurisprudence, his unusual practical experience, the fruits whereof are gathered into this book, gives it a wider scope, by reason of its interest to the medical examiner, the coroner's physician, and the practical doctor when summoned to appear in a legal proceeding.

The writer has evidently made a careful study of the authorities touching upon his various subjects, and to this has added his personal observations growing out of his official work and scientific research. The topics treated of cover a wide range—the identification of the living and of dead bodies, whether in a state of good preservation, decomposed, or mutilated. For that purpose inquiry is made into indications of sex, age, and physical characteristics. The questions of impotence and sterility are frequently of importance in their medicolegal relation, notably in cases of rape, bastardy, adultery, and divorce. The chapters on death from exposure to excessive heat or cold, hanging, drowning, strangulation, poisons, or noxious gases will possess an immediate interest for most of the readers, while the study of wounds, blood tests (to distinguish human blood), and of the medicolegal autopsy concern the coroner's physician or police surgeon more intimately.

As an example of the practical value of the book, a case may be taken where the physician is called upon to determine whether the crime of rape has been committed, by means of an examination of the victim or the perpetrator of the offence, or both. The physical examination may be considerably aided by the suggestions of the

author on this subject. But it must be borne in mind that the accusation of rape is easily made, and that the charge is, from its very nature, difficult to refute. It is frequently made falsely, although in good faith, by hysterical women, and often, too, deliberately and with malicious intent by others. The writer's observations concerning the manner of conducting the examination, the bearing of the accuser and the accused, and other surrounding circumstances may enable the examiner to be of great assistance in bringing about a just determination of the case. So, also, in questions arising out of criminal abortions or infanticide; these are points that come within the field of the physician's investigation other than those revealed by the physical scrutiny. The study of criminals and those upon whom injuries have been inflicted, for more than a quarter of a century, qualify the writer to speak with authority concerning such matters.

There is a chapter in which is discussed the legal status of the physician. Preliminary examination of those desiring to practice medicine is now required in most, if not all, the States of the Union.

This is followed by registration and a license to practice. The statutes of Massachusetts relating to this subject are taken as an illustration. The physician's liability to procedure, civil and criminal, is touched upon, and some of the leading cases are recited. The statutes of Massachusetts concerning the commitment of the insane, and as to the physician's duty to report births, cases of contagious diseases, and to issue certificates of death are probably not dissimilar from those enacted in other States.

It is to be regretted that Dr. Draper has not enlarged his volume to an extent that would permit him to give to the profession his views concerning the ethical relations of the physician to medico-legal matters, in a chapter specially devoted to the subject. More than once he condemns an association with a legal case whereby the physician undertakes any of the functions of a detective. This attitude will appeal to all reputable physicians. Yet in many cases, particularly those where the doctor's examination is the first, and yet more particularly where that examination is made by one in an official capacity, he may direct his attention to matters other than those that are purely medical. Thus, he should note the position in which a body is found, when there are indications of foul play; the direction from which the fatal blow may have come; spatterings of blood near the corpse; the general appearance of the surroundings, and the like.

It is the author's knowledge of such matters as these, coupled with a scientific treatment of his subject, that renders the volume timely and interesting. C. S.

ABDOMINAL PAIN; ITS CAUSES AND CLINICAL SIGNIFICANCE. By A. ERNEST MAYLARD, M.B., B.S. (Lond.), Surgeon to the Victoria Infirmary, Glasgow; Late Examiner in Surgery to the University of Glasgow and Victoria University, Manchester; Formerly Demonstrator of Anatomy Guy's Hospital, London; and Ex-President of the Glasgow Pathological and Clinical Society. London: J. & A. Churchill, 1905.

THIS book by Dr. Maylard is one of the most interesting and instructive books that has appeared lately in medical literature. The symptom abdominal pain confronts the physician more, perhaps, than any other symptom in abdominal disorders, and therefore a book on this subject cannot be other than valuable to all medical men. The first part of the book is taken up with description of the nerve supply of the abdominal wall and viscera, and four diagrams illustrate the various cutaneous areas of referred pain in abdominal diseases. The causes, varieties of pain, also the diagnostic differences of pain arising from diseases of the various organs are gone over at length. The last part of the book is devoted to the surgery of the abdomen, the different incisions for opening the cavity are described and illustrated by a diagram; also methods for closing are mentioned. The treatment of a patient before and after laparotomy is given, and some space is allotted to the results of abdominal operations. The book is well written and cannot be too highly recommended for its practical usefulness. C. F. M.

SAUNDERS' POCKET MEDICAL FORMULARY. By WILLIAM M. POWELL, M.D. With an Appendix containing Posological Table, Formulæ, and Doses for Hypodermic Medication, Poisons and their Antidotes, etc. Seventh edition, revised. Philadelphia and London: W. B. Saunders & Co., 1905.

THIS handy little volume has amply proved its usefulness by the great favor with which it has been received. The first edition was issued in 1892. It has been through the subsequent years revised from time to time and kept thoroughly up to date. In addition to the formulæ, posological tables, etc., it contains the usual tables of poisons and the formulæ of obstetrical data, incompatibles, etc. There is also a very unique little surgical remembrancer, said to be from the pen of an eminent London surgeon, and containing many invaluable hints which every practitioner would do well to learn and remember. There are also some very excellent lists and hints of antiseptic surgery. The book is one of the best of its class. F. R. P.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D.,

REGIUS PROFESSOR OF MEDICINE, OXFORD, ENGLAND,

AND

W. S. THAYER, M.D.,

ASSOCIATE PROFESSOR OF MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND.

The Fourth Disease of Dukes.—v. BOKAY (*Deutsche med. Wochenschrift*, 1904, p. 1651). In July, 1900, Dukes published in the *Lancet* an article entitled "On the Confusion of Two Different Diseases under the Name of Rubella," and designated an infection which he thought could be distinguished by definite characters "fourth disease." This group of cases bears the same relation to scarlet fever that true rötheln does to measles, mild cases of measles being easily confused with rötheln and abortive cases of scarlet fever with the fourth disease. Dukes bases his claim upon the following observations: In 1892 he was called by a director of a school to see 16 boys ill, presumably, with scarlet fever. Having been for some years convinced of the existence of a separate disease confused with mild attacks of scarlet fever, he recognized this type in all the cases, and, although the boys were isolated but fourteen days, not a single instance of transmission of the disease followed their return to their families. In another school epidemic he found, among 31 patients, cases of both scarlet fever and the fourth disease, but, while infection in the former followed in from two to three days after exposure, the incubation period in the latter was prolonged to fourteen or fifteen days. Nine of the children with the fourth disease developed later typical scarlet fever, and 1 case of scarlet fever developed later fourth disease. One of the children with the fourth disease had previously had scarlet fever, and a number of them had rötheln. In a third epidemic of 19 cases of the fourth disease, 42 per cent. of the patients had previously had rötheln.

From these observations, he draws a clinical picture of the disease. The incubation period varies from nine to twenty-one days, and while there are in some instances mild prodromal symptoms, as a rule, the eruption is the first evidence of the disease. This eruption is of a pale, red color, with a finely and compactly papular appearance, scarcely raised above the level of the skin. In a few hours it covers the whole

body, being less evident on the face, while an area about the lips and nose is usually spared. The pharynx is reddened, the tongue coated, and the conjunctivæ injected. Glands in the neck are little swollen, firm, not so large as in rötheln. The eruption fades rapidly and is followed by a general scaly desquamation, which is complete in from one to two weeks. Renal complications never follow. The general health is only slightly affected. The pulse in mild cases is scarcely increased in frequency. The temperature varies from 98.4° to 104°. Constitutional symptoms disappear when the rash is well out, and the child can be out of bed in five or six days. Isolation may be safely discontinued after two or three weeks.

Although Dukes' publication gave rise to a lively polemic among English and American authors, the article of Weaver in the *Journal of State Medicine*, 1901, is the only extensive subsequent contribution to the subject. As medical superintendent of a hospital for infectious diseases, he has been impressed with the frequent occurrence of apparent relapse in scarlet fever characterized by the reappearance of fever and of an eruption. Dukes' article offered an explanation for these manifestations, and on studying the cases carefully, he was able to corroborate Dukes' report in all but minor details.

General acceptance, however, has not been accorded these views, which many prominent authorities ignore, while others oppose them. v. Bokay, from his own experience, feels sure that all who deal much with the infectious diseases of children have met with instances similar to those described by Dukes and Weaver. He believes that he has frequently encountered the disease, but has no observations to cite which would be conclusive enough to strengthen its position. In a review of the literature, however, he finds several important contributions to this question prior to the publications of Dukes. Filatow referred to it in 1885 and devotes a chapter to its discussion under the title "Rubeola Scarlatinosa," in his book on the *Infectious Diseases of Childhood*, published in 1896. The main observation upon which he based his description was this: In a family of eleven children from one to sixteen years of age, scarlet fever was introduced in 1882, three children being attacked. Two years later one of the boys developed, during convalescence from influenza, a profuse, densely punctate, scarlatinoid eruption without angina and with but slight fever. After two days another child developed an identical eruption; on the third day two more children were affected, and just after these the two oldest. The constitutional symptoms were very mild in all cases, and a governess who had previously had scarlet fever was also attacked. Considering these instances of abortive scarlet fever, Filatow assured the family they need have no fear of future outbreaks of the disease. In October, 1885, much to his surprise, scarlet fever again broke out in the family, and four of the children who had previously had the mild eruption became ill, one dying. Filatow defines his position thus: "Under the name of rubeola scarlatinosa I designate a specific, acute, infectious, and contagious disease characterized by a scarlatinoid eruption, but distinguished from scarlet fever by its uniformly mild course and principally by the distinct features of its virus."

Postoperative Parotitis.—WAGNER (*Wiener klin. Wochenschrift*, 1904, Band xvii. p. 1407). Munde in 1878 described the first case of postoperative parotitis following an ovariotomy. In the succeeding years

many more instances were added, and the view which at first prevailed that it was a complication peculiar to operations upon the ovary was soon disproved. In a careful and exhaustive review of the literature, Wagner accepts only 38 cases as coming without doubt into this group, and adds 5 more from Eiselburg's clinic. A composite clinical picture is as follows: In from two to fourteen days, usually from the fifth to the seventh day after operation, the parotid on one side begins suddenly to swell, accompanied by a rise in temperature; this is usually soon followed by a swelling on the other side. The gland continues to enlarge and becomes very painful, hard, and tender, and is surrounded by an area of marked œdema. Pain on opening the mouth and dryness make swallowing almost impossible. At this stage a few of the cases subside and the swelling recedes, but most go on to suppuration, and if not incised opportunely, may rupture into the auditory canal. Pus is not always obtained on incision; there may be diffuse infiltration, with partial necrosis of the gland. The complication is a serious one, averaging in the 42 cases a mortality of 30.2 per cent. Death usually occurs with pyæmic manifestations.

In Wagner's 5 cases the patients were all but 1 over fifty years of age and 4 of them much emaciated by their illness. The diseases and operations were first gastric ulcer, gastroenterostomy second, carcinoma of œsophagus, gastrostomy; third, carcinoma of colon, resection of cæcum, ascending and transverse colon; fourth, carcinoma of pylorus, gastroenterostomy; fifth, cholelithiasis, cholecystectomy. The duration of operation was in 1 case two and a half hours; in 2, one and a half hours, and in the remaining fifty and sixty minutes respectively. In all of the cases vomiting occurred after operation. The parotitis developed on the second, fifth, sixth, tenth, and fourteenth days after operation. In all but 1 case the temperature remained normal up to onset of the complication, and in this 1 there was merely a slight and temporary rise on the day after operation. In 1 instance the complication ran an afebrile course; in 1 there was only slight fever; in another the temperature was normal until shortly before death; while in the other 2 there was a rise to 38.9° and 40.2°. In 3 cases the swelling went on to suppuration, and all 3 died of a terminal bronchitis and lobular pneumonia. In 1 of the cases the submaxillary gland alone was involved; in the other 4 the parotid, twice unilaterally, twice bilaterally.

Wagner thinks the weight of evidence is in favor of mouth infection rather than by the way of the blood current. The histological evidence advanced by Hanson is almost conclusive. The secondary parotidides in infectious diseases are usually caused by organisms commonly found in the mouth and differing from those causing the original disease. In pyæmic processes, moreover, the parotids are seldom implicated. As has been noted, the earlier authors considered the parotitis to depend primarily upon some injury to the ovaries, and, although cases are reported after operation in other fields, the largest number have followed pelvic manipulation. The intimate relation between the genital and salivary glands is well illustrated in mumps; while injury to the testicles is often followed by swelling of the parotids, and many interesting cases are on record of marked functional derangement of the glands in the course of ovarian disease. Skeene-Keith is the only observer who considers the apparent relation between the two purely a matter of coincidence. Pawlow has shown that opening the abdomen and

handling the intestinal coils cause a marked diminution in the flow of the submaxillary secretion. v. Preuschen, on the basis of these experiments, urges that the laparotomy itself, especially when prolonged, is the essential factor, the slowing of secretion allowing more readily an entrance of organisms from the mouth. Berth lays emphasis upon the paralysis of the salivary nerves by the narcotic. Cases of parotitis follow operations other than pelvic, even when the abdominal cavity is not opened. Chloroform paralyzes the salivary nerves. Ether stimulates them, but stimulation is followed by a period of diminished salivary secretion. All of these factors would favor infection from the mouth. Wagner believes trauma by the anæsthetist to be of importance, as experiments show that the parotids can be infected from the ducts only after injury.

An Instance of Family Tabes arising on a Syphilitic Basis.—Nonne (*Berliner klin. Wochenschrift*, 1904, No. 32, p. 345) adds another interesting instance to the growing list of family tabes depending on syphilitic infection. A girl, aged twenty years, was admitted to the hospital complaining of a sense of uncertainty upon her legs, shooting pains, and loss of vision. After a normal birth and childhood she began, at ten years, to gradually lose her eyesight, and for two years prior to her entrance had been almost totally amaurotic. The left eye squints since her thirteenth year. Locomotive uncertainty began in the tenth year, and a little later the paroxysmal pains in the legs. The poorly nourished, rather pale girl showed double optic nerve atrophy, unequal, immobile pupils, old opacities in left cornea, slight static and locomotor ataxia, positive Romberg's symptoms, hyperalgesia, and delayed pain sensation on feet and legs, hyperæsthesia to cold over back, and absence of the patellar and Achilles reflexes. There was no superficial evidence of syphilitic disease and no history of acquired infection. The mother of the girl suffered for twenty years with dysuria, occasional severe lancinating pains, and some unsteadiness on the legs. Her first child was born prematurely at eight months and died a few weeks later with an eruption called smallpox; the second was also born prematurely and died of general weakness; the third and fourth are alive and healthy; the fifth pregnancy ended in an abortion, and four years later the present patient was born. Examination of the mother showed inequality of the pupils, with immobility to light and sluggish reaction on accommodation, absent patellar and Achilles reflexes, slight but definite ataxia in both legs, positive Romberg's symptom, insular hyperalgesia, and delayed conduction on feet and legs, and hyperæsthesia to cold on abdomen. No evidence of previous syphilis could be obtained. Further examination was made of a brother and sister. The brother, aged twenty-five years, was perfectly normal in every particular. The twenty-nine-year-old sister had been married five years and had had two healthy children. She, too, had suffered for sixteen years from lancinating pains and weakness in the legs, and for seven or eight years her sight had been failing. Examination revealed: Argyll-Robertson pupils, Achilles reflex absent on both sides, and patellar on one, slight ataxia and hyperalgesia of lower extremities. In the eyes there was an old choroiditis and retinal opacities. The ophthalmologist Beselin regarded the eye lesions in both sisters as of luetic origin.

Nonne observes that this instance indicates the peculiarities of hered-

itary lues pointed out by Marburg, namely, that it affects women more frequently, and that eye symptoms are prominent and ataxia slight. Both daughters showed definite stigmata of inherited syphilis. Another point of interest is that the disease spared the brother who was born between the two sisters. Why the nervous system should be so prominently attacked in certain cases and spared in others remains undetermined. The influence of surroundings of a family disposition and the peculiarities of different varieties of syphilitic toxin have been urged. Nonne cites instances which apparently support each of these. A man and woman previous to marriage had both independently acquired syphilis; later both developed basal meningitis. Two brothers living apart and infected from different sources, both became tabetic. Before marriage a woman had contracted syphilis from a man with whom she later never lived; both developed tabes.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA; SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSISTANT SURGEON TO THE UNIVERSITY AND PHILADELPHIA HOSPITALS, AND ASSISTANT INSTRUCTOR IN SURGERY IN THE UNIVERSITY OF PENNSYLVANIA.

Ectopy of the Testicle.—Lanz (*Zentralblatt f. Chirurgie*, April 22, 1905, p. 425) says that although ectopy of the testicle refers generally to every testicle which does not occupy its normal place in the scrotum, we distinguish between ectopy of the testicle, which includes every testicle that deviates from its normal path to the scrotum, and retention of the testicle, in which the organ is held somewhere in its normal path of descent. Retention is much the more frequent.

The statement of Curling that a testicle that does not descend within the first year of life will remain permanently ectopic has been widely disputed. Lanz saw a case in which at puberty the testicle first appeared at the external inguinal ring and finally reached the neck of the scrotum.

Although the cause of the trouble is not known, an hereditary tendency is certain. Lanz saw it occur in two brothers. He has never found anything by operation to explain it. In a total of 51 operations he has never found the strong peritoneal adhesions which would result from a recovered case of fetal peritonitis. The final descent in a case of retention is never prevented by the vas deferens, although the shortness of the vessels occasionally interfere.

Almost without exception the testicles show striking macroscopic changes. They are smaller, flabbier, often entirely atrophied, and the always well-developed epididymis is lifted up from the testicle. Since

the nerve and blood supply are no more deficient than when the testicle is in the scrotum, this is not a cause. It is probable that the macroscopic deficiency of the organ, resulting from pressure, a failure of development as such, is the cause of the failure of descent.

In 11 of his 51 cases one-sided castration was done, on account of the marked atrophy and the uncertainty of a safe descent later.

In only 1 case could active spermatogenesis be shown. The albuginea was without exception thickened, in a few cases three to five times the normal thickness. The interstitial connective tissue was sometimes scarce, sometimes much increased, so that the seminiferous tubules were scattered about as isolated islands. Of especial interest were some collections of atypical glandular epithelium, which seemed to support Cohnheim's theory concerning the roll played by misplaced embryonal cells. This is of especial value in relation to the testicle, in which it has been claimed that malignant degeneration occurs earlier than usual. This has lately been disputed. Lanz's findings tend to show an especial inclination of the testicle to malignant degeneration.

Patients usually seek help, not on account of the retention of the testicle, but of the associated complications, the most frequent of which is hernia. Lanz found that the patients rarely complained of sexual disturbances, while, according to the literature, this seems to be very frequent, indeed, the monorchid has been compared to a castrated person. He advises castration when the testicle is markedly atrophied. It prevents a return of the condition, while orchidopexy is frequently followed by return, and it prevents later malignant degeneration. According to his experience, the remaining testicle will, by enlargement, tend to assume the duty of the removed organ.

Of 14 cases treated in the last two years, in 6, or nearly half, castration was done. Only exceptionally were children in the first decade operated on. Massage was advised instead—*i. e.*, stroking along the inguinal canal with a drawing down of the testicle. In 8 of the 14 he did an operation which he calls an extension of the testicle. After dividing the anterior wall of the inguinal canal, he opened the processus vaginalis, and made the testicle present at the external ring. He cut the vaginal process and treated the upper portion as a hernial sac. He then stretched the spermatic cord carefully and reconstructed the posterior wall of the canal on the Bassini principle. Then with a long suture he caught the testicle near its lower pole and passed the suture through a button-hole in the fundus of the scrotum, often poorly developed. Under tension the suture is fastened, with strips of plaster, to the adjacent part of the thigh, or it is bound to a transverse bar fastened between the slightly spread thighs by plaster-of-Paris bandages. The inguinal wound, as well as the button-hole, are then closed.

An Experimental and Histological Study of Cargile Membrane.—CRAIG and ELLIS (*Annals of Surgery*, June, 1905, p. 801) made a very interesting series of experiments upon dogs to determine the value of Cargile membrane in preventing adhesions after operation, especially in the peritoneal cavity. Its irritative action seemed to be the principal factor militating against the otherwise beneficient possibilities of the material.

Whether chromicized or unchromicized, the Cargile membrane is destroyed and disappears, the former in no case lasting to macroscopic view longer than fourteen days, the latter five days. Its presence micro-

scopically was noted some time later. The two doubtless bear relatively the same relation to each other as do the same varieties of catgut.

Neither variety can be depended on to remain where placed. In a situation subject to peristaltic activity the membrane must be anchored, as by sutures. Since both act as irritants, they are of no value in preventing adhesions within the peritoneal cavity.

The membrane is of value in preventing adhesions to wounded nerves and tendons, when such structures lie in tissues subjected to trauma, operative or otherwise. The chromicized is the more valuable. Several layers make a safer and better protection than one layer.

Used to replace destroyed or removed dura mater, the unchromicized is exceedingly difficult to handle, and would be of no special value. Owing to the facility with which the chromicized variety can be handled, its greater toughness and increased power to resist absorption, it would prove of greater value in replacing the dura.

These studies indicate that the membrane is destroyed by a lytic substance or substances contained in the body fluid. Phagocytosis may be safely excluded as a chief important cause.

The Diagnosis and Treatment of Fracture of the Carpal Scaphoid and Dislocation of the Semilunar Bone, with a Report of Thirty Cases.—CODMAN and CHASE (*Annals of Surgery*, March and June, 1905), in an extensive paper, consider that the profession at large does not realize that many sprained wrists are instances of fracture or dislocation of the carpal bones, and they believe that the treatment should be as definitely known as those of fracture or dislocation of any other joint. They summarize the important points as follows:

1. Sprains of the wrist which do not promptly recover are in many cases fractures or dislocations of the carpal bones.

2. The large majority of such carpal injuries are either simple fractures of the scaphoid or anterior dislocations of the semilunar bone.

3. These two injuries are frequently combined, and in such cases the proximal fragment of the scaphoid is usually dislocated forward with the semilunar.

4. Simple fracture of the scaphoid gives a definite clinical picture and may be recognized, even without the *x*-ray, by the association of the following symptoms, viz.: *a*. The history of a fall on the extended hand. *b*. Localized swelling in the radial half of the wrist-joint. *c*. Acute tenderness in the anatomical snuff-box when the hand is adducted. *d*. Limitation of extension by muscular spasm, the overcoming of which by force causes unbearable pain.

5. A broken scaphoid has little power of repair and appears capable of but little callus formation.

6. Fractures of the scaphoid which remain untreated or are treated by massage and active and passive motion generally if not always remain ununited, and the original symptoms persist for years with only slightly abated intensity.

7. Cases of fracture of the scaphoid may unite, if motion of the wrist is prevented during the first four weeks after the injury, but if by this time no union has occurred, future union is unlikely.

8. Excision of the proximal half of a fractured scaphoid gives a somewhat better result than conservative treatment.

9. A posterior incision to the outer side of the tendons of the extensor communis digitorum gives an easy and safe access to the proximal half of the scaphoid.

10. Passive motion of the wrist-joint and active motion of the fingers should be begun within a week after this operation.

11. The possibility of a bipartate scaphoid should be considered in interpreting *x*-rays of simple fractures of the scaphoid, but its occurrence must be very rare in comparison with fracture.

12. Anterior dislocation of the semilunar bone should be recognized clinically, even without the *x*-ray, by the association of the following symptoms, viz.: *a*. The history of an injury of considerable violence to the extended or twisted wrist. *b*. A silver-forked deformity, the posterior prominence of which corresponds with the head of the os magnum, and between which and the lower end of the radius is found a groove representing the position formerly occupied by the now anteriorly dislocated semilunar. *c*. A tumor under the flexor tendons of the wrist just anterior to the lower end of the radius. *d*. A shortened appearance of the palm as compared to the other hand. *e*. Stiffness of the partially flexed fingers, motion of which, either active or passive, is painful. *f*. The persistence of the normal relations of the styloid processes of the radius and ulna and the existence of shortening of the distance from the radial styloid to the base of the first metacarpal.

13. Recent dislocations of the semilunar may be reduced with good result, even after the fifth week, by hyperextension followed by hyperflexion over the thumbs of an assistant held firmly in the flexure of the wrist on the semilunar.

14. Irreducible dislocations demand excision of the semilunar and the whole or a portion of the scaphoid, if there is a coincident fracture of the latter.

Gastroenterostomy and Pyloroplasty: An Experimental Study by Means of the X-ray.—Cannon and Blake (*Annals of Surgery*, May, 1905, p. 686) experimented on cats. Two kinds of food were used, thin-boiled starch to test the passage of fluid contents from the stomach, and canned salmon as a more natural food. Both were mixed with a small amount of subnitrate of bismuth, so that the course of the food could be easily watched by means of a fluorescent screen.

They concluded that the stomach is not a passive bag. During digestion the cardiac end slowly contracts, while over the pyloric end peristaltic waves are constantly running, churning the food with the gastric juices and forcing the chyme into the intestine. Observations on the human stomach show that as the stomach empties the pylorus becomes the lowest point, so that even if gravity drainage occurred the pylorus is the natural outlet as long as the stomach retains the power of contracting.

Intra-abdominal pressure is approximately atmospheric, and the pressure in any part of the passive alimentary canal depends on the weight of overlying abdominal organs. If the canal is inactive, the food is, therefore, as if surrounded by water. Gravity cannot act, and gravity drainage does not occur.

Because the peristaltic waves move toward the pylorus, the intragastric pressure is greatest there, being three or four times greater than at the cardiac end. Unless a gastroenterostomy opening or stoma is

close to the pylorus, the food, even when fluid, is pushed through the pylorus rather than the stoma.

Circulation of the food through the pylorus to the duodenum and back to the stomach through the anastomosis was repeatedly observed, but it was not followed by the clinical symptoms of a "vicious circle." The circulation of food was observed best when the stomach was full, the intestinal wall, by stretching of the stomach, being drawn up into line with the gastric wall and closing the opening. The symptoms usually ascribed to a "vicious circle" were shown to be associated with a kink of the intestine just distal to the anastomosis. This is due to a break in the peristaltic wave from the division of the circular muscular fibres of the bowel at the opening.

Food passing through the stoma from the stomach is highly acid and is not brought into contact with the neutralizing juices of the duodenum. Ulcers which occur occasionally in the jejunum, opposite or near the stoma, may be due to the abnormal presence there of acid chyme. No case of ulcer of the duodenum after pyloroplasty has been reported.

The stoma should be large and as near the pylorus as possible, and overeating should be avoided to prevent the closure of the stoma by stretching of the stomach. Kinks may be oviated best by attaching a narrow band of the distal gut to the stomach for several centimetres beyond the stoma, thus permitting peristalsis to become an effective force. The probability of a "vicious circle," the non-mixture of food with the duodenal juices and the dangers from kinks in gastroenterostomy make the operation not an ideal one. In pyloroplasty these objections are avoided.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.,

ASSISTANT PHYSICIAN TO THE PRESBYTERIAN HOSPITAL (OUT-PATIENT DEPARTMENT), NEW YORK.

The Serum Treatment of Exophthalmic Goitre.—DR. K. THIENGER states that Moebius has had good results with the serum of sheep from which the thyroid glands had been extracted six weeks before bleeding. This serum was given by mouth in wine. Following its administration the goitre diminished and the constitutional symptoms were ameliorated, but the condition of the pulse remained unchanged. The author has treated 4 patients with this serum. During the treatment no other medication was given, save bromides, to one of the cases. The general condition was improved by the treatment, the pulse rate

became slower, but in 3 of the patients the size of the goitre was unchanged, and the exophthalmos persisted. Possibly, in the author's opinion, these facts may have been due to the small dosage employed. A remarkable result, however, was achieved in a man, aged twenty years, with typical exophthalmic goitre, who was in very bad condition when first seen, presenting all the symptoms of a profound toxæmia. Four days after the institution of the serum treatment the size of the goitre was lessened, the pulse rate had fallen from 140 to 98, and the improvement continued until seven weeks later the patient was discharged with very little exophthalmos, an increase in weight, and a pulse rate of 76.—*Münchener medizinische Wochenschrift*, 1905, No. 1, p. 15.

Atropin in Puerperal Fever.—Dr. R. Drenkhahn has used this drug for ten years in cases of parturition or abortion followed by rise in temperature, and regards it as a useful agent in this connection. It is superior to opium, in that it does not cause constipation, and in that the pupil gives an index of its effect. Atropine is efficacious only when the infection is confined to the uterus and is incapable of influencing an infection which has involved the lymphatics and has become generalized. The author reports a case in a primipara, aged twenty-six years, with the infection confined to the uterus, in which complete cure in nine days followed the exhibition of atropine. Another patient in whom the infection had become generalized was unaffected by the drug. The reason for the action of atropine in this condition lies in the paralytic action which it exercises upon the uterine muscular fibres.—*La semaine médicale*, 1905, No. 7, p. 78.

Serum Therapy in Syphilis.—Dr. F. J. Bosc, impressed by the similarity between sheeppox and syphilis, has prepared a serum from the blood of sheep previously injected with blood from syphilitic individuals. Having assured himself of the harmlessness of this serum, he has injected it into patients, both before and after the appearance of the eruption. In the former class of patients the rash was not, as a rule, prevented from appearing, but it consisted merely of macules and was delayed beyond the usual time. One patient injected on the eighteenth day after the appearance of the chancre, showed no eruption two months later. The dose of the serum was 5 drachms.—*La semaine médicale*, 1905, No. 2, p. 20.

Methyl Alcohol.—Dr. H. W. Wiley, in a paper upon this substance and its uses, states that it is probable that its toxicity is due, in considerable measure, to impurities, but, nevertheless, he considers that its addition, either pure or refined, to beverages or medicines cannot be too severely condemned. He also believes in its elimination from liquids for external use, such as bay rum, and considers that it would be wise to lay a small tax upon wood alcohol, both in manufacture and sale, for the purpose of establishing over it the same legislative supervision which attaches to ethyl alcohol, and which supervision should extend, as it ought to do in the case of grain alcohol, to all remedies and beverages made therefrom. All medicines and remedies containing alcohol, which are not official, should be subjected to the same regulations in manufacture and sale as the corresponding quantity of alcohol

sold as such. The sale of medicines of which alcohol is the chief valuable constituent, without control, without notification, and without the knowledge of the consumer, is a condemnable practice, whether the alcohol be ethyl or methyl. If it be the latter, the practice should receive additional condemnation, because of the greater toxicity of this compound.—*American Journal of Pharmacy*, 1905, No. 3, p. 101.

Mercury Lactate in Syphilis.—Dr. A. Bouveyron prescribes, in the early stages of syphilis and later, when the buccal or lingual mucous membranes are affected, pastilles containing 0.075 grain of mercury lactate, which the patient is told to dissolve in the mouth after eating. The dosage is six per day. The pastilles have very little metallic taste, and they have a distinct effect in buccolingual syphilides; the mucous patches become less painful and tend to heal quickly. Syphilides of the throat are less favorably affected, although dysphagia becomes less distressing. The pastilles also act well in mercurial stomatitis, because of their bactericidal effect upon the micro-organisms of the mouth. Their only disadvantage is that they blacken the dorsum of the tongue.—*La semaine médicale*, 1905, No. 3, p. 30.

Veronal Poisoning.—Dr. H. Kress has observed, in 3 neurasthenic patients who had taken 7½ grains of veronal nightly for insomnia, symptoms of intolerance after three or four days, characterized by marked somnolence, loss of appetite, and weakness. Dr. J. Kuhn has observed a patient who had taken the drug in the same dosage, and after a few days exhibited a slight febrile movement, with dryness of the mouth and burning sensation in the throat. A morbilliform eruption appeared upon the face, which, in a few days, extended to the chest and arms and became confluent; this was followed by a vesicular and bullous eruption upon the buccal and pharyngeal mucous membranes, conjunctivitis, and pain in the ears. For six days the elevation of the temperature persisted, and not until the eighth day did the symptoms disappear. From these cases we may conclude that veronal may exercise a cumulative action and cause toxic symptoms more or less grave.—*La semaine médicale*, 1905, No. 6, p. 69.

The X-rays and Sterility.—Drs. F. Tilden Brown and Alfred T. Osgood report upon the *x*-ray as a factor in the causation of sterility. Eighteen instances among *x*-ray workers have been observed by them, and of these all who had done extensive work with the ray for more than three years showed absence of spermatozoa in the seminal fluid, while those who had been engaged in the work for a shorter time and had been careful to avoid direct exposure showed different states of oligonecrospermia. Other cases were examined whose exposures have been infrequent and short, whose seminal fluid was normal. The cases showing sterility are men in excellent health. There has not been the least sign, subjective or objective, of the development of the sterility, and there has been no deterioration of the sexual activity. One-half of the men are married, and none of these has had a child since he undertook this work. The authors cite an instance which had been treated by the *x*-rays for pruritus ani, with the result that, notwithstanding the use of a shield, a necrospermia was produced. This cleared up in five months. In the more thoroughly exposed cases, however, the question of prognosis

must remain in abeyance until evidence of the recuperative power of the seminiferous tubules be collected. Meanwhile the operator of Roentgen ray tubes should work behind a screen impenetrable by the rays, and should expose himself as little as possible. Proper tube shields should be used. The authors conclude with the statement that repeated, prolonged exposures of the testes causes sterility in the human being. Adequate protection to all parts of the body not directly exposed for examination should invariably be provided.—*American Journal of Surgery*, 1905, No. 9, p. 179.

Renal Organotherapy.—Dr. F. Choupin reports results from the administration of macerated pork kidney. A uræmic patient, over whose symptoms ordinary treatment had no influence, was greatly improved as soon as he began to take 10 drachms of the kidney daily. In another patient the substance was given for seven months. On suspension the uræmic symptoms reappeared in about fifteen days, but disappeared upon resumption of the treatment. This form of treatment has certain drawbacks, such as gastric disturbance, skin eruptions, etc., but these are never grave, and disappear soon after the suspension of treatment. The skin eruptions seem to signify that the medication is acting favorably. The kidney substance has a marked diuretic action, diminishes hypertension of the arteries, and also exercises a certain antitoxic effect. Its influence over albuminuria is *nil*, yet it causes amelioration of all symptoms. The author uses the kidney macerated without previous washing to remove the urine, and adds to it syrup of limes; he considers two kidneys daily the proper dosage.—*Revue de médecine*, 1905, Nos. 1 and 2, pp. 64 and 130.

Dechloridation in Phlegmasia Alba Dolens.—Dr. H. Signoret has employed this means in post-partum phlegmasia. In his opinion, the treatment is applicable of other forms of the affection, especially those accompanied by œdema. Before beginning the treatment, it is necessary to determine the degree of retention of chlorides. To diminish these we need only remove the salt from the diet, both that used before and after cooking. The diet itself is of little importance, the preference being given to broiled meats, vegetable purees, cooked fruits, and pastry. The progress of the treatment is best tested by estimation of the chlorides excreted by the urine, frequent weighing of the patient being contraindicated by reason of the possibility of causing embolism. In 6 patients observed by the author, the œdema disappeared in a comparatively short time, ten or twelve days at most, and the dietetic changes were well borne by the patients.—*La semaine médicale*, 1905, No. 8, p. 91.

Treatment of Hay Fever.—Prof. Alfred Denker, while acknowledging the advances in the treatment due to the elaboration by Dunbar of his antitoxin, which is extracted from the pollen of graminaceous plants, advocates what is, in his opinion, a preferable method which acts favorably, not only upon the attack, but also prevents recurrences, at times for two years. To allay the irritability of the nasal mucosa, the author resorts to massage of this stricture after preliminary anæsthesia, which is brought about by means of an application of a solution of cocaine hydrochlorate, 10 parts; adrenalin, 0.1 part; distilled water, 100

parts. With this the entire nasal lining is swabbed by means of cotton upon an applicator, or if the patient is very sensitive, a spray of 1 per cent. cocaine may be employed first. After the anæsthetic has taken effect the lining of the nose is massaged by means of a cotton swab dipped in a 10 per cent. of oily solution of europhen, the pressure used being gradually increased. The procedure is carried out daily for from two to four minutes for each nasal cavity, depending upon the sensitivity of the patient. In cases with marked conjunctival involvement a few drops of tincture of opium and water, equal parts, are instilled. The treatment is effective in preventing a recurrence during the following season in the majority of cases.—*Münchener medizinische Wochenschrift*, 1905, No. 19, p. 902.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,

AND

THOMPSON S. WESTCOTT, M.D.

Thymic Stridor among Infants.—C. HOCHSINGER (*Revue mensuelle des maladies de l'enfance*, 1905, vol. xxiii., No. 3, p. 97) examined 58 infants with the radiograph from the standpoint of the size of the thymus. He found an enlarged thymus in 26 of them, and 20 of these presented the symptom-complex of congenital stridor. He considers this disease due to a compression of the trachea induced by the enlarged thymus gland. In addition to the radiographic examination, he considers percussion of the thorax as important in making a diagnosis; he further refers to the connection between enlargement of the thymus and hereditary syphilis, as well as that existing between hypertrophy of the spleen and the thymus.

Treatment of Capillary Bronchitis with Mustard-water Pack.—O. HEUBNER (*Therapie der Gegenwart*, 1905, Band xix. No. 1) has employed this method for several decades, fighting with it particularly the capillary bronchitis of young children up to the third year, and particularly those acute cases of mucopurulent catarrh leading to danger of asphyxia within a few hours or days; they occur especially often in the course of measles and whooping-cough, but sometimes also without apparent infection; the greater number of the patients are weak children with a rachitic thorax. They are usually very much prostrated, their faces deadly pale, the respiratory frequence, however, very high. A number of 70 to 80 respirations is not out of the ordinary, the pulse is small and frequent, the fever high. The thorax is filled with many very fine rales, showing that the greater part of the bronchial tree is filled with tough mucopus. The treatment consists in mixing 1 pound of mustard flour with 3 pints of hot water; the mixing process is continued for a matter

of ten minutes—that is, until the oil from the mass irritates the nose and eyes. A large sheet is now saturated with the mustard solution, wrung out and spread over a woollen blanket. The entire body of the patient from the neck down is rolled in the covers, which are tied about the neck and feet, so that the child will not have to breathe the mustard-laden air. After from ten to twenty minutes (depending upon reaction and strength of the patient) the child is taken out; its skin will be a lobster red; a hot bath or sponge comes next, and the child is then wrapped in a warm-water pack, in which it remains from one to two hours; if the child's head becomes very red or marked perspiration sets in, the cloth is at once unrolled, and a second warm bath, followed by a cooling shower, is resorted to. This ends the procedure for the day. Within twenty-four or forty-eight hours the patient is usually much better, and convalescence is established very soon after.

A Foreign Body in the Larynx of a Boy.—HOEDLMOSER (*Wiener klin. Wochenschrift*, 1905, Band xviii., No. 13, p. 332) relates the case of a boy, aged nine years, who, while eating soup six days before his admission to the hospital, swallowed a piece of bone; as it gave him no trouble the first day after the accident, it was thought to have reached the stomach; on the second day he had slight difficulty in breathing, and an examination showed the bone fastened in the larynx. Breathing became more and more difficult until the day of admission, when a violent respiratory stridor, especially on deep inspiration, was noticed. The laryngeal examination revealed a swollen and reddened mucous membrane; in the sagittal direction of the larynx a white furrow could be made out, passing from the anterior to the posterior wall; on each side of it a small lumen could be seen. Extraction of the foreign body was successful on the fifth attempt; no cocaine was applied because of the very marked dyspnœa. The bone was found to be triangular; its flattened surface 2 mm. thick, its sides 17, 17 and 18 mm. long. The remarkable part of the case is the long time the bone remained in the larynx, the successful endolaryngeal removal at one sitting, in spite of the patient's youth and the great amount of stenosis due to the inflammation, the fact that no anæsthetic was needed, and the size of the bone, very large for a boy's larynx.

Treatment of Coryza in Nurslings.—Acute coryza of nurslings is not by any means a harmless affection; the occlusion of the nasal passages and the accumulation of the secretion, by obstructing nasal breathing, have a number of sequelæ. Nutrition is seriously interfered with, and lung diseases are predisposed to. L. BALLIN (*Therapie der Gegenwart*, 1905, Band vii., No. 2, p. 65) thus describes his method of treating such cases: Adrenalin preparations are used in preference to cocaine, because of the slighter toxicity. Small cotton tampons are saturated with adrenalin solution, 1: 1000, and introduced into the nasal orifices alternately and kept there for two to three minutes; the mucous membranes become anæmic and the swelling decreases. This has to be repeated three to four times daily, as the adrenalin action persists only about four hours. A cure is usually produced in a few days. The fluid secretion diminishes quickly, and the crust formation must be treated with white vaselin. In weak infants, in whom the acute infection often passes into a persistent rhinitis, characterized by bloody mucopurulent

secretion, he employs, in addition to the adrenalin, ½ or 1 per cent. solution of silver nitrate, permitting 1 drop to enter each nasal orifice daily. The treatment must be continued beyond the time necessary to produce a cure. Of 75 children with coryza, 48 were treated according to this description; 6 developed bronchitis, 1 very weak infant died of bronchopneumonia; of the other 27, 12 developed bronchitis, 1 died of pneumonia. The nutrition of the latter group suffered much more than that of the former. Syphilitic coryza was also favorably influenced, and there have been no more deaths from lung complications in this disease since this treatment has been applied.

Hysterical Right-sided Deafness with Simultaneous Hyperæsthesia of the External Ear.—R. DOELGER (*Münchener medizinische Wochenschrift*, 1905, Band lii., No. 14, p. 652) reports the case of a girl, aged twelve years, who, at the age of six, fell into a deep ditch; at eight she had pneumonia, followed by suppuration of the right middle ear, which lasted almost six months. For some months she complained of pain over and in the right ear, right-sided headache, dizziness, and nausea early in the morning. Examination of the ears showed the left one to be perfectly normal, the right mastoid tender, but no changes in the soft parts. The external auditory meatus was found extremely tender. The whispering voice could not be heard at all. Otherwise the examination was perfectly negative; the child was loquacious and bright, and there seemed no difficulty for her to continue a conversation. The case was believed to be one of hysteria, chiefly because of this normal general state and the tenderness of the lower bony part of the external meatus. Ice was applied locally and the mastoid rubbed daily with iodized vaselin. After fourteen days of such treatment she could hear perfectly well, only the hyperæsthesia remaining unchanged.

Cardiac Dilatation in Diphtheria.—H. DIETLEN (*Münchener medizinische Wochenschrift*, 1905, Band lii., No. 15, p. 683), writing from Moritz's clinic in Greifswald, reports having examined 47 diphtheria patients by means of Moritz's orthodiagraph, the patients being in a reclining position, and having found 20 of these afflicted with myocardial conditions of various degree. In 15 of these (75 per cent. of the myocarditis patients and 32 per cent. of the total number) dilatations of varying degree were demonstrated with the orthodiagraph. This myocarditis appears usually in the first half of the second week, and in fully half the cases it leads to dilatation of some extent. In most of the cases dilatation begins with the myocarditis, but sometimes already before pulse changes are apparent; it increases gradually, reaching its acme with the height of the myocarditis, during the third week of the disease; it is associated usually with a diffuse apex beat, visible cardiac pulsation from the second to the seventh interspace, reduplication of the cardiac sounds, occasional murmurs, especially a blowing systolic sound and accentuation of the second pulmonic sound. Retrogression commences in the fourth week of the disease; in 2 instances out of 14 examined, it became complete within a short time, but in most it remained only partial. While complete recovery is possible, even in the worst cases, it is likely that in most of them it is only partial. The pulse changes are no criterion for the amount of the dilatation, some slight pulse changes being associated with marked dilatation and *vice*

versa. Percussion does not discover slight degrees of dilatation, and cannot be relied upon as the orthodiagraph can for absolute outlines. The prognosis is not absolutely bad, but the sight of such a heart calls attention to the danger in which such patients are constantly from paralysis of the heart. They should not be allowed to get up until the dilatation has receded to a point within the danger line.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE; PROFESSOR OF OBSTETRICS AND DISEASES OF INFANCY IN THE PHILADELPHIA POLYCLINIC; CLINICAL PROFESSOR OF DISEASES OF CHILDREN IN THE WOMAN'S MEDICAL COLLEGE; VISITING OBSTETRICIAN TO THE PHILADELPHIA HOSPITAL, ETC.

Studies in the Physiology of the Uterus.—FRANZ (*Zeitschrift für Geburtshülfe und Gynäkologie*, 1904, Band liii., Heft 3) gives the results of his studies in the physiology of the uterus in animals as follows: He found that the uterus is at all times strongly susceptible to the different kinds of electric currents. The reflex excitability of the pregnant uterus is much greater than that of the non-pregnant. When the uterus of a rabbit is excised it is not readily stimulated by the electric current. On the contrary, thermic influence strongly stimulates the excised uterus. If immersed in a bath of salt solution at the temperature of the body, the uterus first relaxes slightly and then vigorously contracts. If the temperature of the bath be raised uterine contractions increase, followed by dilatation. If the temperature is lowered, contractions increase both in vigor and in duration. Both electric and thermic stimuli often produce contractions, followed by relaxation in rhythmical form. There is no essential difference in the behavior of the human uterus and that of animals when excised from the body. In animals the vagina shows a similar reflex irritability to that of the uterus. Chloral hydrate given beneath the skin causes spontaneous contractions of the uterus in animals to cease; ergotine stimulates contractions and increases the tendency to rhythmical contraction. Atropine, whether given subcutaneously or into the veins, has little or no influence upon the uterus of animals. The reflex excitability seems somewhat diminished. Nicotine produces in the uterus in animals strong and continued contraction.

The Ability to Nurse the Child.—MARTIN (*Archiv für Gynäkologie*, 1905, Band lxxiv., Heft 3) gives the results of observations at the clinic at Stuttgart regarding the ability of women to nurse their children. Four-fifths of the patients under observation were blondes, one-fifth of them brunettes; 48 per cent. were primiparæ; 52 per cent. multiparæ. In 11.3 per cent. the breasts were only moderately developed; in 1.9 per cent. they were poorly developed, and in 2.1 per cent.

the nipples were flattened. In 1178 mothers 88.2 per cent. nursed their children; 10.5 per cent. nursed them partly; only 1.3 per cent. could not nurse them. As regards the results of nursing exclusively, 40.9 per cent. of the children had reached their original weight on the eighth day after birth, and 59.8 per cent. on the thirteenth day. When the children were partly fed and partly nursed 25.9 per cent. had reached or exceeded their original weight by the eighth day, and 35.6 per cent. by the thirteenth. The loss in weight for the first eight days after birth of children exclusively nursed was 18.6 grams to each 1000 of the body weight, and among those children partly nursed and partly fed the initial loss was 41.6 grams to 1000. By the thirteenth day children fed exclusively from the breast had exceeded their initial weight by 9.6 grams. It was found that those fed and nursed at the same time gained more slowly than those entirely nursed.

Infants fed exclusively by artificial means lost more rapidly after birth, and had a much smaller percentage of gain afterward. In the cases of those mothers who were greatly weakened by labor, as through hemorrhage or exhaustion, it was found that their children when they were able to nurse them gained more rapidly than did children partially nursed or children fed exclusively by artificial means. It was found that wounds of the nipples occurred in nursing mothers in 39 per cent. These were usually treated with success by strict asepsis and the use of some form of nipple shield. In 13 per cent. of the mothers there was painful swelling of the entire breast or some portion of it. This readily subsided with the use of a bandage and the lessening of liquids in the food taken. In 0.32 per cent. breast abscess occurred.

Nursing was interrupted or abandoned only in the severest diseases of the mother. Widespread tuberculosis, profound derangement of the blood, and those diseases which brought the child in danger were considered adequate indications for weaning. Syphilis of the mother was not considered a justifiable cause for removing the child from the breast.

In the last ten years it was found in the clinic that the number of women able to nurse a child had increased from 40 per cent. to practically 100 per cent. The ability to secrete milk for the child did not depend upon the size of the breasts, but upon the vigor of the reflex stimulation applied to the nipple. This might be either central or peripheral, the child furnishing the central reflex irritation through nursing.

Martin also calls attention to the psychic influences which affect lactation, notably the influence of depressing emotion in suspending the secretion of milk.

He believes it to be of especial importance that the child be placed to the breast as soon after birth as possible.

The Permanent Results of Delivery with the Use of Bossi's Dilator.—LICHTENSTEIN (*Archiv für Gynäkologie*, 1905, Band lxxv. Heft 1) has ascertained the condition of 18 patients in whose delivery Bossi's dilator was employed at Leopold's clinic at Dresden. In 11 of these cases no laceration of the cervix was found. In 4 there was slight laceration of the vaginal portion, in 2 extensive laceration of the vaginal portion, and in 1 bilateral laceration of the cervix. In none of these cases was there evidence of perimetritis following a tear. There was 1 case

of perimetritis upon the posterior aspect of the uterus with adhesions, but this could not be ascribed to the use of the dilator, as no laceration of the cervix had occurred. There had been, however, a chronic retroversion which had not been treated. In 1 case there was retroflexion of the uterus with descent. This condition gave rise to so much irritation that epileptic attacks apparently resulted. In 4 other cases there was retroflexion without other complications. In 1 case abortion occurred in a pregnancy following, and the patient had, after the use of the dilator, a small laceration in the vaginal cervix. There is, however, no evidence that abortion resulted from this. As the patient had severe eclampsia, it is more probable that her abortion was caused by some lesion of the kidneys. Five of these patients had subsequently been delivered in their own homes, and 4 were found on investigation to be in a pregnant condition. Of the 5, 3 had no lacerations, 1 had a small tear of the cervix, another had an extensive tear. Of the 4 patients found in a pregnant condition, 2 were in the seventh, 1 in the eighth, and 1 in the second month. One of these had contracted pelvis. Of the 17 women, 10 had subsequently become pregnant and 1 of these only had aborted. In the remaining 7 there were 4 cases of retroflexion, and 2 of these were complicated by prolapse of the uterus. As regards the symptoms complained of by these patients, 10 were without pain or distress, 3 had vaginal catarrh and constipation, 1 had disability resulting from an operation upon the ovary, 1 had metrorrhagia, but had no laceration of the cervix, and 1 was intensely nervous, for which no cause in the pelvic organs could be found. As regards ectropion, it was present in 3 cases only and to a mild degree. The result of the investigation of these patients showed that the use of Bossi's dilator in skilful hands is not followed by permanent damage to the patient's health.

An Abnormally Long Umbilical Cord.—GOTTSCHALK (*Zentralblatt für Gynäkologie*, 1905, No. 5) describes a placenta with an umbilical cord 72 cm. long. The child was born in breech presentation living, the mother having a normal pelvis. The cord was filled with blood and twisted into many spirals. It was wrapped about the child, and especially about the neck, in such a manner as to make breech presentation the only way in which the child could be born living. Compression of the vessels of the cord produced the transudation of serous fluid. The entrance of the breech in the pelvis and extraction of the head were rendered more difficult by the coiling of the cord.

Ligature of the Spermatic and Hypogastric Veins in Puerperal Pyæmia.—BUMM (*Zentralblatt für Gynäkologie*, 1905, No. 5) has ligated the spermatic and hypogastric veins in 2 cases of patients suffering from puerperal pyæmia. In the first the patient had frequent and violent rigors, the veins were traced upward into the abdominal cavity, and were ligated very carefully to avoid opening the vessels. In the second case chills ceased entirely after the operation.

The Ultimate Disposition of Embolic Placental Cells.—SCHMORL (*Zentralblatt für Gynäkologie*, 1905, No. 5) has examined the bodies of 150 women dying in various stages of pregnancy and in the puerperal state. He paid special attention to the lungs in these bodies. He found that placental cells were carried into the lungs as emboli very frequently.

In 83 cases of eclampsia these cells seemed to be unusually abundant. In women dying in early pregnancy placental cells were found in the lungs much less frequently than in those perishing at full term. Microscopically the lungs were unchanged.

In cases of vesicular mole these cells are also found, and in process of rapid growth.

Shall the Practising Physician Be Advised to Employ Bossi's Method of Delivery? —In the *Archiv fur Gynäkologie*, 1905, Band lxxv., Heft 2, DUHRSSEN strongly urges against rapid dilatation of the unaltered cervix by Bossi's dilator. He very naturally contrasts with this his method of delivery by vaginal Cæsarean section. He reports several interesting cases.

The first case was that of a primipara with a flat pelvis, and who had gone considerably over the usual time for delivery; had been long in labor and had a greatly distended lower uterine segment; the head had failed to descend, but was wedged in the pelvis. To relieve the tension in the lower uterine segment and to enable delivery to take place, Dührssen performed vaginal Cæsarean section. He first made a free incision upon the right side of the vulva and tied bleeding vessels, then the cervix was seized by forceps, the inferior portion divided, and also the lower posterior walls of the vagina, the anterior lip was then divided, and also a portion of the anterior vaginal wall 5 cm. in length. The bladder was then loosened from the vagina, when the hand was readily introduced into the uterus, and version readily performed. A large child was delivered, asphyxiated, but was revived. The placenta was delivered by hand; the uterus packed with gauze; incisions and lacerations closed with catgut. The operation consumed forty minutes. Mother and child made a good recovery.

This case seems to us one in which the operator took a very great and unjustifiable risk. A contracted pelvis and an overgrown child cannot usually be overcome by incision into the soft parts; the indication was rather for abdominal Cæsarean section than for vaginal, and the operator was more fortunate than wise in his procedure. In his accustomed nands this attempt was made successfully, but an operator less experienced with this method might have torn the uterus to a fatal extent during delivery.

Dührssen also reports 2 cases of threatened eclampsia; 1 in which labor was brought about by the insertion of a bag; while the second patient came into spontaneous labor after the introduction of a bougie. His purpose in reporting this case seems to be to show that he does not in all cases perform vaginal Cæsarean section, and that there are also cases which can be delivered before the reports of his cases.

His fourth case was one of eclampsia at seven months in a multipara, in whom the cervix had been lacerated and was enlarged and very hard; the cervical canal admitted one finger. In this case vaginal Cæsarean section followed by version was performed. The patient made a good recovery.

Dührssen states that after dilatation with Bossi's dilator, 37.5 per cent. of the children are lost, and 22.6 per cent. of mothers. In 137 cases of vaginal Cæsarean section he has lost 19, a mortality of 14 per cent.

It must be remembered that the results of vaginal Cæsarean section do not compare favorably with abdominal Cæsarean section. In cases

of normal pelvis where the fœtus is not abnormal in size in the hands of an operator accustomed to perform vaginal section, this method may be useful. It has, however, its very decided limitations, and should not, we believe, be applied in cases of considerable pelvic contraction.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.,

OF NEW YORK.

ASSISTED BY

WILLIAM E. STUDDIFORD, M.D.

Results of Alexander's Operation.—FUCHS (*Zentralblatt für Gynäkologie*, 1905, No. 20) reports 220 cases from Werth's clinic. In 69 patients who were kept under observation a recurrence took place in 14.4 per cent. No case of hernia was noted. The canal was laid open and Bassini's method was followed in two-thirds of the cases. There were 7 cases of temporary displacement following labor, while in 6 other women the uterus remained in its normal position.

Division of the ileoinguinal nerve was seldom followed by subsequent pain.

The writer is opposed to shortening of the round ligaments after the separation of adhesions. Vaginal fixation is preferable in cases of prolapsus with retroflexion.

Desmoid Tumors of the Abdominal Wall.—PFEIFFER (*Beiträge zur klin. Chirurgie*, Band xliv., Heft 2) reports 40 cases from Bruns' clinic and 360 from the literature; 89.4 per cent. occurred in women, the majority having borne children. The umbilicus was never affected. The microscopic diagnosis between fibroma and fibrosarcoma is difficult, nor does the occurrence of round and spindle cells in the growth necessarily imply malignancy. The writer has never observed a case of pure myoma, though he has rarely met with fibromyxoma and fibromyoma, and one case each of pure myxoma and myxosarcoma.

He explains the etiology of desmoids, like Ribbert, by the theory that after hypertrophy of the abdominal muscles and connective tissues following labor the walls become overstretched, herniæ and spaces occur, which, as the result of hyperæmia and cell-proliferation, are filled in with neoplasms. Trauma is doubtless a common etiological factor. It is not necessary, however, to infer with some authors that these tumors have their origin in hæmatomata.

Desmoids cause but little pain, which is sometimes most marked at the time of menstruation. Rapid growth is not an indication of malignancy. They may undergo degeneration and even suppurate and discharge through the skin.

An important diagnostic point is the sharply circumscribed character of the neoplasm, and its immobility when the abdominal muscles are contracted. They are distinguished from intraperitoneal tumors by the fact that the greater portion of the mass is external and that they do not change their position with change of posture and inspiration. Abscesses, cysts and gummata must be considered.

The writer advises removal of the tumors, even in the early months of pregnancy, on account of their tendency to grow rapidly in this condition. In the later months interference would be justifiable only if the neoplasm was so large as to threaten to interrupt the pregnancy, or hemorrhage or suppuration occurred. In excising it the surgeon should extend his incisions into healthy tissue, whether the peritoneal cavity is opened or not. Gaps in the peritoneum can be filled in with flaps from the neighboring serous membrane or omentum, while plastic operations will supply defects in the muscular wall.

The primary mortality is only 4.55 per cent.; the prognosis being most favorable in cases in which the peritoneal cavity is not opened.

In 107 patients who were kept under observation, local recurrence occurred in 21.2 per cent. in women and 50 per cent. in men, the more unfavorable statistics in the latter being due to the fact that the growths were nearly always sarcomatous. Repeated operations have been performed with an ultimate good result, since many of the recurrent neoplasms are pure fibromata.

Enterostomy in the Treatment of Peritonitis.—GEBHARD (*Deutsche Zeitschrift für Chirurgie*, Band lxxiv., Heft 1 and 2) believes that the principal danger in septic peritonitis is intestinal infection, the retained intestinal contents constituting septic foci, from which the peritoneum is poisoned. He accordingly advises enterostomy, in order to drain away this infectious fluid.

He reports 8 cases of incipient peritonitis, in which he adopted this method of treatment, in all of which the establishment of an intestinal fistula was followed by arrest of the general infection and subsequent cure.

Spontaneous Replacement of the Retroverted Uterus.—KLEINWACHTER (*Zeitschrift für Geb. u. Gyn.*, Band liv., Heft 1), observing 366 cases of uncomplicated movable retrodisplacement for a period of years, found that the uterus returned to its normal position spontaneously in 11.2 per cent., and remained thus. He believes that this occurs more frequently than is usually supposed.

Cancer following Removal of Benign Ovarian Tumors.—SCHRŒDER (*Zeitschrift für Geb. u. Gyn.*, Band liv., Heft 1) adds the following case to the 6 already reported: Three and one-half years after the removal of a small multilocular cystadenoma of the left ovary (the right being also extirpated, as it was cystic) the abdomen was reopened on account of ascites. At the same time a portion of the thickened abdominal wall at one side of the old cicatrix was excised, and when examined microscopically proved to be adenocarcinoma. The peritoneum was studded with cancerous nodules, hence the inference that infection had occurred during the removal of the pseudo-mucin cyst, with subsequent malignant degeneration.

Pneumococcus Infection of a Dermoid Cyst.—Rissmann (*Deutsche med. Wochenschrift*, 1905, No. 13) reports the case of a woman, aged thirty-two years, who, on the eighth day after the inception of lobar pneumonia continued to have a high pulse-rate and temperature. She had had an abdominal tumor for several years, which was removed and proved to be an immense dermoid cyst. Pure cultures of pneumococci were made from the cyst contents. Since there were no intestinal adhesions, the writers believe that the infection took place either through the blood, or secondary to the pneumococcus peritonitis.

Lutein Cells in Pregnancy.—Seitz (*Zentralblatt für Gynäkologie*, 1905, No. 19), from an examination of the ovaries of 17 women who died during or soon after pregnancy, concludes that the atresia of the follicles differs from that which occurs in the non-pregnant in the marked development of the cells of the theca internum, usually known as lutein cells. As long as uterine pregnancy persists (even when pathological) ovulation ceases and the follicles degenerate. This applies to chorion epithelioma, as opposed to cancer of the uterus. The writer ventures to express no theory as to the physiological significance of this increase of lutein cells during pregnancy.

Foreign Bodies in the Uterus.—Knoop (*Zentralblatt für Gynäkologie*, 1905, No. 19) reports 2 cases and cites nearly 100 others from the literature.

In the first case a hairpin was removed from the uterus, having been introduced six years before. The patient was fifty-seven years old; had ceased to menstruate ten years before, and was sent to the clinic for supposed cancer of the corpus uteri, on account of an offensive discharge.

Sterilization by Resection of the Tubes.—Reifferscheid (*Zentralblatt für Gynäkologie*, 1905, No. 19), in referring to 2 cases of Küstner's, in which women became pregnant after portions of the tubes were ligated and excised, describes the method practised unsuccessfully at the Bonn clinic. At the time of a second Caesarean section each tube was tied with silk in two places near the uterine end and an inch was excised, after which the uterine stumps were turned in and sutured, but the patient, nevertheless, became pregnant again and premature labor was induced. The writer accordingly agrees with Küstner that the only sure way to prevent future impregnation is to excise the tubes entirely, as in pyosalpinx.

The indications for the operation must be strictly defined, and it should be performed only with the consent of the patient's husband.

Action of Streptococcus Pyogenes on the Vaginal and Uterine Mucosa.—Heinricius (*Archiv für Gynäkologie*, Band lxxiv., Heft 22), from experiments on rabbits, concludes that when the superficial epithelium is intact the bacteria are unable to make their way through or between the cells into the subjacent muscular tissue, the reverse being true if the epithelium becomes desquamated or is exfoliated. The writer also finds that the lymphatics are the usual channels of peritoneal infection in cases of septic endometritis. The factor of individual susceptibility to infection was clearly shown in experiments upon rabbits, which is

often borne out by clinical observations in the human subject, in whom general sepsis may develop without discernible local lesions.

Cauterization in Inoperable Cancer of the Uterus.—LOMER (*Zentralblatt für Gynäkologie*, 1905, No. 19) reported to the Hamburg Obstetrical Society a case of cauterization of an inoperable cancer in which the uterus, previously firmly adherent, became so movable that total abdominal extirpation was easily performed a few days later, no involvement of the pelvic glands and tissues being found. The speaker referred to a similar case in which the uterus was successfully extirpated five years after curettement and cauterization.

In the discussion which followed opinions differed, both as to the value of cauterization and the frequency of metastasis in the lymph nodes.

Clinical Observations in Ovarian Tumors.—LIPPERT (*Archiv. für Gynäkologie*, Band lxxiv., Heft 2) analyzes 638 cases occurring in the Leipzig clinic in the course of seventeen years, the operative mortality being 5 per cent., or 3.7 per cent. in benign and 13.13 per cent. in malignant growths.

The writer agrees with Byford that ovarian tumors are more frequent in married women—in fact, over 96 per cent. of the papillary variety occurred in those subjects. Menstruation was comparatively little affected, even with double cysts. Amenorrhœa was occasionally noted. Adhesions were present in 48.5 per cent.

Abdominal ovariotomy was performed in 81 per cent., and exploratory incision alone was performed in only 3.9 per cent. of the benign growths and 23.5 per cent. of the malignant.

As to the question of removing the opposite ovary, its cystic condition and the age of the patient were the principal points considered. A second ovariotomy was performed in 3.3 per cent.

Etiology of Purulent Tubo-ovarian Cysts.—SCHAFFER-HEIDELBERG (*Archiv für Gynäkologie*, Band lxxiv., Heft 2) refers these cysts to a former inflammatory process. He believes that the fimbriated end of an inflamed tube becomes adherent to the ovary, and that suppuration occurs in the latter, so that it is transformed into an abscess. Interuterine infection as a result of direct applications or the use of tents may cause the lighting up of old tubal inflammation. Vaginal incision and drainage is the treatment recommended.

Early Diagnosis of Tuberculosis of the Uterus.—SCHATTLANDER (*Monatsschrift für Geb. u. Gyn.*, Band xxi., Heft 1 and 2) does not believe that polymorphism and multiplication of the cells of the glands and endometrium is sufficient to justify the suspicion of commencing tuberculosis in the absence of bacilli, unless gonorrhœa or recent abortion can be positively excluded. Moreover, the demonstration of the presence of tubercle bacilli, although an important aid to diagnosis, is not confirmatory as in the finding of giant cells.

Innervation of the Female Pelvic Organs.—JUNG (*Monatsschrift für Geb. u. Gyn.*, Band xxi., Heft 1 and 2), from a careful study of serial sections of fœtuses, arrives at the following conclusions: In the new-

born a large ganglion is found in the parametric tissue opposite to the junction of the cervix and vaginal vault, from which chains of ganglia radiate downward to the pelvic floor and upward to the ureter and vesicouterine pouch. These communicate with the ganglia behind the rectum, around the ovary, and with the renal ganglia.

This cervical ganglion does not form a plexus, but constitutes a mass of plexuses to which all the genital nerves converge. It is not as large as Frankenhäuser pictures it, but is composed largely of connective tissue. The entire vagina is surrounded by a network of nerve fibres and ganglia, situated partly within the paravaginal connective tissue, which communicate with the large ganglion before mentioned.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

J. SOLIS-COHEN, M.D.,
OF PHILADELPHIA.

Diphtheria Antitoxin in the Treatment of Goitre.—Dr. Robert T. Legge, of McCloud, Cal. (*Journal of the American Medical Association*, April 22, 1905), reports a case of a lady in whom he had injected 1500 units of antitoxin on two successive days in the treatment of a moderately severe pharyngeal diphtheria, contracted in nursing a fatal case of the disease in a child. This lady had exophthalmic goitre of eight years' duration, with all its classic symptoms. Four months later Dr. Legge noticed that the large tumor of the neck had disappeared and that the eye symptoms were a trifle better. After a lapse of one year there had been no return of the enlargement. Two cases are reported in which the antitoxin was given purposely, and in which marked reduction of the tumors took place in from three to five months after two injections at about ten days' interval.

Stenosis of the Nasal Cavity Caused by Contraction of the Palate and Abnormal Position of the Teeth; Expansion by the Treatment of the Maxilla.—At the Fourth International Dental Congress held at St. Louis, Mo. (*Dental Cosmos*, May, 1905), Dr. G. B. Maercklein, of Milwaukee, read a paper upon this subject and recommended an apparatus for the purpose suggested by Dr. Schroeder by which he had performed a great number of expansions of the maxilla in treating cases of prognathism, and always succeeded in effecting nose breathing where it had been impossible before.

Artificial Noses.—The *Dental Cosmos* for May, 1905, contains interesting illustrated articles by Dr. Louis Ottofy, of Manila, P. I., who made an artificial nose for a Chinaman; Dr. W. H. Baird, of Burlington, Iowa, who supplied an artificial nose to a lady; and Dr. Lee Baker, of

Port Townsend, Wash., who supplied a nose to a girl, aged sixteen years, who had lost palate, as well as nose, and in whom the artificial contrivance not only improved the personal appearance, but enabled her to talk and sing. The patient last mentioned had continually complained of cold air keeping the soft tissues so inflamed that she suffered a great deal of pain, but since the artificial appliance has been in use the tissues have resumed their normal condition and she has increased greatly in weight and general health.

Sarcoma of the Nose.—Dr. William H. Ballenger (*Laryngoscope*, February, 1905) reports a case of a young lady with a sarcoma of the nose in which he first removed nearly the whole of the right inferior turbinate and submitted it to a pathologist for examination, receiving the report that the process was tuberculous. This report being unsatisfactory to him, he removed some more tissue and received a report that it was granulation tissue. Feeling that the case was one of sarcoma, despite the findings of the pathologist, he decided to operate by the radical method of sawing through the maxillary bone and turning the nose down over the mouth. In this way he was able to remove a large amount of necrotic and diseased tissue. After submitting specimens to the pathologist, he received a report that the disease was sarcoma. There had been no recurrence at the date of the report.

Cleft Palate.—At the International Dental Congress, held at St. Louis, Mo., Dr. T. W. Brophy, of Chicago (*Dental Cosmos*, May, 1905), exhibited some patients and read a paper on "The Radical Treatment of Congenital Cleft Palate." In cases associated with harelip, he advocated operating upon the palate first, in order to have more room for this procedure. He operates at as early a date as practicable, even in children but ten days old, and would always operate, if possible, before the third month of age.

At a meeting of the Laryngo-Rhino-Otological Society of St. Petersburg, (*Archives internationales de laryngologie, d'otologie et de rhinologie*, Mai-Juin, 1905) Prof. Simanovski presented a patient in whom he had successfully utilized the mucous membrane and periosteum of the septum narium in forming a flap in a plastic operation of a portion of the fissure remaining uncovered after previous operations.

Removal of Adenoids.—At a late meeting of the American Laryngological, Rhinological and Otological Society, held in Chicago, Dr. George L. Richards (*Laryngoscope*, February, 1905) showed a very large adenoid removed from a child aged six years, which had given rise to asphyxia on spasmodic closure of the jaw just as the child was apparently under complete ether anæsthesia. He had to resort to artificial respiration, hypodermic injections, forcible opening of the jaw, and traction of the tongue, in order to resuscitate his patient.

Primitive Tuberculosis of the Turbinate Body.—At a recent meeting of the Laryngological Association of Vienna, Dr. Glas (*Archives internationales de laryngologie, d'otologie et de rhinologie*, Mai-Juin, 1905) presented microscopic preparations made from the anterior portion of a middle turbinated bone amputated for the purpose of gaining access

to the opening of the left maxillary sinus, which had discharged pus for two months, in a young lady, aged twenty years. Although the slightly hypertrophied mass did not show ulceration nor granulations, microscopic examination revealed portions containing lymphoid tubercles and epithelial cells with partial caseation and a large number of giant cells. The secretion from the sinus, however, did not furnish any bacilli. The lungs were apparently normal.

Disease of the Maxillary Antrum of Dental Origin.—At a late meeting of the American Laryngological, Rhinological and Otological Society, held in Chicago, Dr. George L. Richards (*Laryngoscope*, February, 1905) presented a specimen of a capped tooth which had set up antral disease. He had seen it stated in some publications that dentists had been held responsible for setting up antral trouble by capping teeth which ought to have been treated otherwise.

Tuberculosis of the Pharynx and Rhinopharynx.—Dr. Glas (*Archives internationales de laryngologie, d'otologie et de rhinologie*, Mai-Juin, 1905) reported a case of tuberculosis of the pharynx and rhinopharynx in a man, aged twenty-nine years, who, the previous Easter, had had a bone incarcerated in his pharynx for some eight days. When examined, the apex of the left lung was in a suspicious condition, and the left vocal band presented a slight thickening near the anterior commissure. The mucous membrane of the pharynx was covered with several masses of reddish granulations with grayish nodules upon them here and there. Behind the right palatopharyngeal fold was a cicatrix, 2 cm. in length, corresponding with the original wound. There was ulceration at the orifice of the left Eustachian tube and another at the vault of the pharynx. Scrapings from some of these structures revealed the presence of tubercle with necrosed centre containing large giant cells and some bacilli, but neither the mucopurulent secretion nor the scabs contained bacilli.

Laryngeal Tuberculosis.—Dr. E. S. Bullock, of Silver City, N. M. (*Monthly Cyclopædia of Practical Medicine*, March, 1905) extols mopping the tissues twice a day or oftener, with a weak solution of formaldehyde, 2 to 10 drops of the 4 per cent. solution to the ounce of water; or as the second best application, with trichloride of iodine, ½ to 2 grains to the ounce of distilled water.

Unusual Foreign Body in the Larynx.—Dr. Zianoury, of Constantinople (*Archives internationales de laryngologie, d'otologie et de rhinologie*, Mai–Juin, 1905), reports an instance of the inspiration of pieces of eggshell in the larynx of a boy, aged six years, while taking soup. The foreign body, supposed to be a fragment of bone, evaded detection by palpation, laryngoscopy, and radioscopy, both before and after tracheotomy. A thyrotomy was performed to expose the interior of the larynx, when some pieces of eggshell were caught upon the gauze swab used for mopping the blood. It is supposed that the thinness of the foreign body prevented its recognition under the *x*-rays.

Syphilitic Tracheal Stenosis in a Six-year-old Child.—Dr. Lee Maidment Hurd, of New York (*Laryngoscope*, February, 1905), reports a case of tracheal stenosis in a boy, aged six years, who had been infected

by a kiss at three years of age. Low tracheotomy revealed a syphilitic infiltration below the larynx, with an aperture about as large as an ordinary silver probe. Alternate use of the tracheotomy cannula and of a long intubating tube, with protracted use of mercurial inunctions and iodide of potassium, successfully relieved the case from all manifestations of syphilis at the end of seven months' treatment. This child took on an average of 180 grains of potassium iodide a day for more than a month and was still taking 180 grains in the day at intervals at the date of the report.

Syphilitic Ulceration of the Œsophagus in an Infant Eighteen Months of Age.—Dr. Fackeldey (*Annales des maladies de l'Oreille du larynx, du nez et du pharynx*, Mars, 1905) has reported the case of an infant with dysphagia attributed at first to foreign body in the œsophagus. Œsophagoscopy revealed an ulceration undergoing cicatrization. Recovery followed antisyphilitic treatment and dilatation of the cicatrix.

Foreign Bodies in the Œsophagus.—Dr. Carl E. Black, of Jacksonville, Ill. (*American Medicine*, January 28, 1905), reports 2 cases of foreign bodies in the œsophagus in children, one a pin and the other a half-inch iron washer, the location of both of which were determined by fluoroscopy and skiagraphy. Attempts at extraction were made under the guidance of the fluoroscope successfully as regards the pin; unsuccessfully as regards the washer.

In the manipulation the head of the patient was drawn over an end of a table and held in position by an assistant. The Roentgen-ray tube was placed beneath the patient, so that the operator could hold the fluoroscope with his left hand and direct the forceps with the right hand.

DERMATOLOGY.

UNDER THE CHARGE OF

LOUIS A. DUHRING, M.D.,

PROFESSOR OF DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA,

AND

MILTON B. HARTZELL, M.D.,

INSTRUCTOR IN DERMATOLOGY IN THE UNIVERSITY OF PENNSYLVANIA.

Lichen Spinulosus.—H. G. Adamson (*British Journal of Dermatology*, March, 1905), under this name, describes clearly an affection of the skin occurring in children, usually boys, characterized by formation of fine filiform spines arranged in groups distributed over the trunk and limbs. The filiform spines arise from the pilosebaceous follicles, the mouths of which are slightly raised to form pinhead-sized papules, either of the normal color of the skin or slightly red. They are unaccompanied by itching or other subjective symptoms, and there is little or no disturbance of the general health. Histologically, the lesions show the

process to be essentially a hyperkeratosis of the follicle, perifollicular inflammation being absent or but very slightly existent. The difference between this disease and lichen pilaris is carefully pointed out. It is well known in England, but is not so clearly described in France. Cases are occasionally met with in this country.

Anatomy of Dermatitis Papillaris Capillitii (Kaposi).—Josef Guszman (*Dermatologische Zeitschrift*, March, 1905) writes a lengthy article on the subject, concluding by stating that this disease consists of a chronic granulation process, which in the beginning has its seat in the upper layers of the skin, gradually extending downward through the involvement of circumscribed perivascular areas. The sebaceous and sweat glands in the beginning show no changes, but are later involved secondarily, with the result finally of being, to a greater or less extent, destroyed and disappearing. The characteristic peculiarity of this disease is the existence of granulation tissue without tendency to disintegration, but taking on a remarkable consistence in the form of a fibrous mass, causing in the end a disappearance of the hair follicles and hairs.

Liquid Air and its Possibilities.—S. G. Tracy (*Medical Brief*, February, 1905) states that even when it became possible to make liquid air at a comparatively inexpensive price (it is now sold at ten dollars per gallon, as made by the Tripler system in New York), its usefulness would have been limited or of no avail in medicine, except for the invention of a bulb by Dewar, used to hold this extraordinary product. It is a glass vessel with two walls, the space between being exhausted to high vacuum. When liquid air is contained in one of these it evaporates at one-fifth the rate it does in an ordinary glass receptacle. When liquid air is applied to the skin and tissues of the body the parts are immediately frozen. At first there is anæmia of the part, followed by reddish reaction or slight inflammation. If the freezing has been severe, there results a bleb. Liquid air is not only a local anæsthetic, little or much anæsthesia being produced by it in a few seconds' time, and the anæsthesia lasts longer and is followed by less sloughing than any other freezing mixture. Slight pain attends the application. After anæsthesia has been obtained a minute or more should elapse, as the tissues may be too hard for operation. It is applied with a swab of absorbent cotton on a wooden applicator, firm pressure being used, the application lasting from twenty to sixty seconds, depending on the tissues to be affected. The histories of several cases of cutaneous carcinoma and nævus are related. In lupus erythematosis, where the lesion is not too large, the author thinks it more satisfactory than any other remedial agent.

Treatment of Lupus, Angioma, Nævi, and Keloidal Scars with Radium.—Werner and Hirschel (*Deutsche med. Wochenschrift*, 1904, No. 42) report good results with raying by means of radium daily or every other day for several hours over a period of from three to fourteen days. The remaining scars were white, smooth, and satisfactory, and recurrences were not observed in from six to nine months afterward.

Paget's Disease and its Relation to Carcinoma of the Breast.—H. C. Jacobaeus (*Virchow's Archiv*, Band clxxviii., Heft 1) concludes from his studies that the so-called Paget's disease is a carcinoma, from the

beginning originating in the glandular epithelium of the ducts. The Paget cells are not carcinomatous, degenerated, localized, epidermis cells, but are glandular carcinomatous cells that have wandered. Their occurrence, isolated or in little groups, is the result of a peculiarity of the epidermis.

Treatment of Cutaneous Diseases by Combined Ointment and Phototherapy.—L. STEINER (*Journal of the American Medical Association*, June 11, 1905, p. 1970) states that far better results are obtained when ointments are used at the same time as reflected electric light than when either is used alone. Numerous experiments at Hoffmann's clinic at Leipzic are reported, nearly 40 cases being recorded. The active hyperæmia induced probably accounts for the good results, this being supplemented by the bactericidal action of the rays. When used with a sulphur or mercurial ointment, eczema, cycosis, acne, and other diseases were more rapidly and favorably influenced than by any other method of treatment known to the author.

Treatment of Scalp Ringworm.—T. C. FOX (*Practitioner*, April, 1905) recommends the employment of the old and well-known treatment by means of croton oil, advising the use of an ointment 1 drachm to the ounce. This is rubbed in daily or as often as necessary to excite the desired amount of inflammation. The inflammatory products, including crusts, are cleaned off as they form.

Hyperidrosis Axillæ Successfully Treated by X-rays.—G. H. STOVER (*Archives of Physiological Therapy*, April, 1905) relates the history of a remarkably severe instance of this affection occurring in a young married woman, the fluid poured out being enough to saturate the clothing to the waist and to drip. The quantity was estimated at two quarts daily. This condition had existed for many years, in spite of all manner of treatment, local and internal. A low tube, four inches from the skin, exposing each axilla on alternate days for ten minutes, was used. After the trunk exposure the skin showed slight pigmentation, and after the twenty-fourth exposure there existed slight erythema—never more than a mere blush. At the thirty-first exposure the perspiration was distinctly less; at the thirty-eighth there was very great improvement; at the forty-fifth the hair fell out rapidly. At no time did the hair become gray or white. Treatment was now intermitted, the perspiration being somewhat in excess of the normal amount. Four months later the axillary hair had returned. Twelve exposures were now given on succeeding days. After the eighth pigmentation appeared and the hair fell again, and there was slight erythema at the end of the series and the perspiration had stopped entirely.

Cutaneous Anthrax Successfully Treated by Sclavo's Serum.—LOCKWOOD and ANDREWS (*British Medical Journal*, January 7, 1905) report a case occurring on the cheek of a man who worked with horse hair; 40 c.c. of the serum were injected into the abdomen, no other remedies being employed. The temperature at the time was 102.4°, and the pulse 92, but during the night the temperature fell to 98.6°. During the following two days no further improvement was noted, but on the third day there was distinct improvement. No further dose of the serum

was given, and seventeen days later only a small granulating sore remained, thus proving the efficiency of the serum treatment.

Radium Treatment of Cancer.—A. EXNER, of Vienna (*Deutsche Zeitschrift für Chirurgie* and *Journal of the American Medical Association*, April 15, 1905) describes a case of carcinoma of the cheek of a woman, aged seventy-three years, which had been declared inoperable by some surgeons. Radium was used daily for a month, then the lesion was curetted and radium again applied for twelve days. He grinds 60 mg. of radium bromide with about 1.5 c.c., of xylol and adds 2 drops of dammar. This mixture is placed in an aluminum box about 1.5 cm. square. The radium dust settles to the bottom very evenly when stirred. The strength of the radium used equals twelve Holzknecht units in four hours.

Diseases of the Skin Connected with Errors of Metabolism.—L. DUNCAN BULKLEY (*Medical Record*, November 26, 1904) gives an interesting article on a subject but little understood. He concludes from his studies, based on many thousands of cases, that metabolism is principally affected by the kind of nutriment taken, the action of the digestive organs of the nervous system. Certain cutaneous lesions or eruptions have been credibly reported as connected with or dependent upon the generally recognized metabolic conditions of gout, rheumatoid arthritis, diabetes, obesity, and scrofulosis; but as yet no absolute statements can be made as to the necessary connection of the two, for the same eruptions occur in several of the metabolic affections. The idiosyncrasy of the individual and many causative elements, external or internal, nervous, etc., often determine which form of skin disturbance or alteration shall take place. Errors of diet, disorders of digestion, faulty excretion, and nervous derangement often find their ultimate expression or mode of action through the faulty metabolism induced thereby. Metabolic errors are manifested not only through the lungs, intestines, and kidneys, but also through the skin. The author finally calls attention to the importance of complete and minute urinary analysis in discerning metabolic errors and in establishing proper therapeutic measures for the cure of many diseases of the skin.

Treatment of Alopecia Areata.—KROMAYER (*Deutsche med. Wochenschrift*, 1904, No. 31) reports the cure of 6 rebellious cases of this disease by means of cold iron light (Triplet or dermo lamp), the rationale of the treatment being found in the artificial inflammation of the skin. The latter is provoked by frequent use of the lamp up to a point of considerable inflammation of the skin, when a rest is allowed, and then the same treatment begun again.

Effects of Roentgen Ray on Cancer.—R. H. VOSE and W. C. HOME (*Journal of Medical Research*, January, 1905) made observations on 120 cases. The effect on ulcerated surfaces was in the beginning that of stimulation as evidenced by the granulations, but later the epithelium is destroyed and granulation retarded. Cutaneous carcinoma treated by the *x*-ray shows a degeneration of the tissues affected, which, however, is not to be distinguished under the microscope from degenerations of the skin due to other causes. As to the bloodvessels, there occurs an

endarteritis; where healing occurs there is new formation of blood-vessels, as takes place elsewhere during the process of repair, and there is an augmentation of the elastic tissue. The authors arrive at the conclusion that the cure of carcinoma by *x*-ray is due to destruction and exfoliation, and that this fact limits the value of the agent to superficial cases.

The Finsen Method.—MILTON FRANKLIN (*Medical News*, December 31, 1904) discusses the subject of the treatment of the tuberculous diseases of the skin by means of the ultraviolet or chemical rays of the spectrum, and describes the apparatus used. The latter should be free from glass and powerful, if good results are to be expected. The use of the *x*-ray in lupus and kindred diseases, he thinks, has been too limited to regard this agent as of great value, whereas, the Finsen apparatus has positively cured these diseases in a large number of instances, and he consequently looks upon it as preferable to the *x*-ray method.

Quinine-Iodine Treatment of Erythematous Lupus.—M. OPPENHEIM (*Wiener klin. Wochenschrift* and *Journal of the American Medical Association*, March 25, 1905) speaks in praise of Holländer's method of treating this disease by quinine internally and iodine externally, the patients being 6 cases in Finger's clinic, 2 being cured and the others much benefited. Experiments made upon animals led the author to the conclusion that impregnation of the body with quinine attracted the iodine employed locally to the cutaneous lesions, where it acted specifically. Bisulphate of quinine, in increasing doses up to 1 drachm daily, was used, the local lesions being brushed with tincture of iodine twice daily after removal of the crusts with alcohol and ether, with occasional interruptions. Treatment was continued for a month.

Radiotherapy of Carcinoma.—DJEMIL PASHA (*Revue de Chirurgie*, from *Journal of the American Medical Association*, March 11, 1905) reports 7 cases of carcinoma treated with *x*-rays with good results; 3 were cured, 3 were benefited, and 1 not relieved. He advises this method as a palliative treatment in advanced deep-seated carcinoma, its influence on the cachexia being very favorable.

Treatment of Lupus by X-rays and the Finsen Lamp.—F. H. JACOB (*Medical Electrology and Radiology*, November, 1904) arrives at the conclusion that better results are obtained by the use of accessory treatment with the rays and the light, especially the topical use of carbolic acid just prior to using the light; also pyrogallol in the form of ointment or plaster, 20 grains to the ounce. Drugs of this kind will remove the larger lesions of lupus, but the minute outlying lesions so difficult to reach are best healed with the light. The author regards the scar following the Finsen light as better than that of the *x*-rays. The chief disadvantage of the *x*-ray is that it is prone to produce enlargement of the bloodvessels with structural changes, in the form of telangiectasis. This unfortunate result may be obviated by employing the rays for short periods at each sitting or for a long time at long intervals. While the beauty of the scar following the Finsen light is esteemed, the slowness and tediousness of this treatment is emphasized.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

SIMON FLEXNER, M.D.,

DIRECTOR OF THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH, NEW YORK.

ASSISTED BY

WARFIELD T. LONGCOPE, M.D.,

DIRECTOR OF AYER CLINICAL LABORATORY, PENNSYLVANIA HOSPITAL,

AND

G. CANBY ROBINSON, M.D.,

RESIDENT PATHOLOGIST, PENNSYLVANIA HOSPITAL, PHILADELPHIA.

Changes in the Circulatory Apparatus, Especially in the Peripheral Vessels in Typhoid Fever.—Wiessel (*Zeit. f. Heilk.*, 1905, Band xxvi. p. 107) has made a study of the histological changes in the heart and peripheral vessels in cases of typhoid fever. All those cases were excluded in which the vessels showed chronic endarteritis or in which some complication might mask alterations due to the typhoid fever alone. Besides the heart muscle, the aorta, pulmonary artery, radial, iliac, and femoral arteries were particularly investigated. The heart muscle showed fatty and parenchymatous degenerations with certain changes in the cell nuclei; but no new facts of special moment were brought out during this part of the investigation. Very important alterations were, however, found in the walls of the peripheral vessels. This subject has attracted the attention of certain French writers who describe lesions of the intima, especially in the coronary arteries. The main changes noted by the author were not in the intima, but in the middle coat of the vessels. Both the muscle fibres and the elastic tissue proved to be diseased. The muscle fibres showed atrophic changes, together with an increase in the intercellular connective tissue with proliferation of these cells. But by far the most pronounced changes were noted in the elastic tissue. The elastic fibres were broken, torn, and frequently stained poorly. In places the degenerative changes in this tissue were very noticeable. The alterations in both musculature and elastica are viewed by the author as a degenerative process dependent in all probability upon the typhoid infection.

Experimental Measles.—Hektoen (*Journal of Infectious Diseases*, 1905, vol. ii. pp. 238–255) reviews the various attempts that have been made to produce measles by inoculation, and concludes that there is no absolute proof that any of these attempts have been successful. His own work upon the subject consists in two apparently successful attempts to reproduce the disease by human inoculation. In 2 cases typical measles occurred thirteen days after injection into young adults of blood withdrawn from patients suffering from measles. The blood was taken during the first thirty hours of the eruption and kept for twenty-four hours in ascites broth at 37° C. before inoculation. All precautions against contamination of the blood were carefully observed, and the patients in whom the inoculations were made were free from exposure

to measles, both being convalescent from scarlet fever in hospitals that contained no cases of measles. The author considers that his experiments show that the virus of measles may be obtained unmixed with other organisms and in such a form that it may be studied by various methods.

Immunization against Tuberculosis.—BAUMGARTEN (*Verhand. der deut. Path. Gesellschaft*, 8th Tagung., 1904, Heft 2, p. 133), stimulated by v. Behrring's observations upon the apparent immunization obtained in cattle against the bacillus of Perlsucht by previous inoculations of slightly virulent human tubercle bacilli, repeated the experiments in the hope of discovering a means of protecting man. He found that cattle treated with human tubercle bacilli acquired an immunity against doses of the bacillus of Perlsucht which were fatal to control animals. This immunity may last for two and one-half years. Even a single subcutaneous injection of human tubercle bacilli will protect against Perlsucht infection, though the animal remains immune not longer than a year. The injection of bacilli from human sources, highly virulent for guinea-pigs, does not produce in the cattle a typical local tuberculosis; the tubercle bacilli are rapidly destroyed and at the points of inoculation only inflammatory changes are found. These experiments, according to Baumgarten, do not oppose but rather substantiate Koch's doctrine of the duality of human and bovine tuberculosis; the blood serum of these immunized animals has not, up to the present time, possessed either protective or curative properties for rabbits and guinea-pigs. In case the future is unable to offer a curative serum for tuberculosis in man, the possibility of a protective immunization similar to that obtained in cattle may be considered.

In this connection, the experiments of Pearson and Gilliland (*University of Pennsylvania Medical Bulletin*, 1905, vol. xviii. p. 30) are of great importance. In testing a herd of shorthorn cattle, which were known to be tuberculous with tuberculin, twelve calves from six to eight months old, were found which responded to the test. These animals were divided into two lots of six each, as nearly equal as possible in respect to age size, weight, and conditions. One of these lots was then subdivided into two groups of three each. The three calves of one of the subgroups were given seven intravenous injections of a standard suspension in water of tubercle bacilli of human type, the inoculations covering about three months. The three calves of the other subgroup were given after each injection of human tubercle bacilli from three to five injections of tuberculin (until the hypersensitiveness to the tuberculin was lost). The second group of six calves were kept as controls and were given no treatment whatsoever. All the animals were kept together under exactly the same conditions.

Two controls died before the experiment was completed, one control and one treated calf were killed about one year after treatment, and the remainder were killed at the end of eighteen months. All the six control or untreated animals showed more or less widespread and active tuberculosis; in one animal the disease was in the most advanced form and of widest distribution. In all of the six treated animals the lesions were small, quiescent, and encapsulated, though they contained living tubercle bacilli. The observations thus showed a decided difference between this lot of young cattle that were treated and the six that were not treated. Since the two lots of animals were in all respects as nearly

equal as possible at the beginning of the experiment, and since they were cared for all together in precisely the same way, excepting in respect to specific treatment, the authors think it but fair to conclude that the six treated animals were favorably influenced by the treatment. The authors hold that under such treatment as was given, tuberculous lesions do not extend, on the contrary, that they recede and that new implantations do not occur, even upon prolonged contact with tuberculous herd mates.

The Biology of the Micro-organism of Actinomycosis.—J. H. WRIGHT (*Journal of Medical Research*, 1905, vol. xiii. p. 349) presents in an essay, to which was awarded the Samuel D. Gross Prize of the Philadelphia Academy of Surgery, an extensive study on the biology of the branching filamentous micro-organisms isolated in pure culture from 13 cases in man and 2 in cattle of actinomycosis. He considers the organisms to be all of one species, essentially an anaerobe, growing well only in agar and bouillon and in the incubator. He found that the filaments took on the "club" appearance only when grown in immediate contact with animal fluids or within the animal body. Experimental inoculation caused the formation of tumor masses of small sizes, which showed but little progressive tendency. The organism could be regained, but there was little evidence that multiplication had taken place within the animal.

The author considers actinomyces bovis to be the proper name for the organism. He does not accept the prevalent belief, based on the work of Bostroem, Gasperini, and others, that the specific infectious agent of actinomycosis is to be found among certain branching micro-organisms widely disseminated in the outer world, which differ profoundly from actinomyces bovis in having spore-like reproductive elements. On account of the fact that the organism he described does not grow on all culture media and practically not at all at room temperature, the author does not believe that it has its usual habitat outside of the body. He advances the hypothesis that the organism is a normal inhabitant of the secretions of the buccal cavity and of the gastrointestinal tract. The part played by foreign bodies he believes is in the formation of a nidus where the actinomyces develop to form actinomycosis, and he does not think that straw and like foreign bodies so frequently found in actinomycotic lesions are the carriers of the micro-organism.

The "club" formation about the filaments is considered as a protective function. The bacteria so frequently found accompanying the disease are, the author believes, important in the spread and continuance of the infection, forming new sinuses to be reinfected with actinomyces bovis from the buccal cavity and the gastrointestinal tract.

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All communications should be addressed to—

DR. FRANCIS R. PACKARD, 1831 Chestnut Street, Philadelphia, U. S. A.